Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 47 JANUARY, 1927 No. 1

New Ray Makes Cold Stones Glow

Rocks Lit for Hours after Exposure to It, While Light Also Grows Hair and Kills Germs

MAKING cold stones glow with brilliant lights, growing luxuriant hair on a rabbit's ear and producing more electrons, or beta rays, with a single small tube than could be obtained from 2,000 times all the radium in the world are some of the things done with a new cathode-ray tube discovered by Dr. W. D. Coolidge, of the research laboratories of the General Electric company.

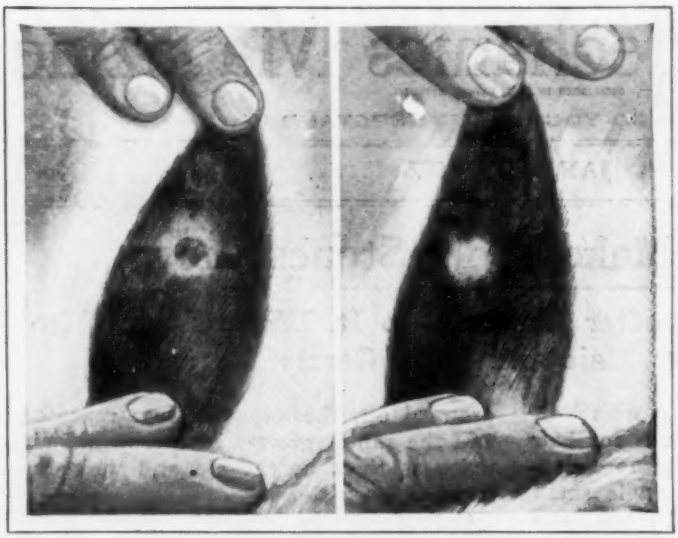
With only about one pound of radium in existence, the Coolidge tube, at the turn of a switch, can produce beta rays equal to those that would be given off by a ton of nature's product, and, whereas man has never found a way to control the radium rays or regulate the disintegration of the substance that produces them, the electrons from the new tube can be regulated, and when the rays are not needed production ceases.

What the practical application of the tube will be remains to be seen, as the discoverer has not yet tried the rays on human beings. In the only experiment made on a living organism, the ear of a rabbit was given a tenth of a second exposure, with the result that its brown hair disappeared. After the scab of the burn dropped off, the exposure was repeated, and the rabbit grew a new crop of hair, twice as thick as the old and white instead of brown.

Giant Cathode-Ray Tube Perfected by Dr. Coolidge; It Produces 2,000 Times as Many Beta Rays as All the Reclaimed Radium in Existence, Kills Insects and Germs, and Also Makes Stones Glow with Cold Light

Cathode rays have been known for many years, at first only as they existed inside vacuum tubes. Thirty years ago a European scientist succeeded in getting some of them outside the glass by passing them through a tiny "window" of aluminum foil cemented to the glass wall of the tube. The window, however, was very small and the operating voltage slight.

The new Coolidge tube is a marked improvement on previous efforts, because it has a large window, three inches square, made of nickel foil several thousandths of an inch thick and capable of withstanding an atmospheric pressure of more than 100 pounds, while the tube is shielded with a copper cylinder to prevent puncturing of the glass by the electrons. A tungsten filament, similar to the one in a radio tube, gives off the electrons at the relatively low speed of a mile a second. Between the window and the copper shield, however, there is impressed upward of 350,000 volts of direct current, and when the rays go through



Rabbit's Ear, Left, with Scab Marking Spot Where Hair Was Burned Off, and, at Right, New Hair of Different Color after Second Exposure

space they speed up to an average velocity of 150,000 miles a second. They reach that speed in the space of an inch, and then pass on out of the high-tension current and coast along, with little loss of velocity, passing through the window.

Operated in the dark, the window is seen surrounded by a ball of luminous purple haze, about two feet in diameter, made by the air being ionized or broken up by the rays. One of the startling experiments made with the tube was the production of a new yellow compound, deposited as a light, fluffy powder when the rays were passed through acetylene gas. The powder is insoluble in any chemical yet tried on it, and, as it adheres tightly to metals, may be developed as a new protective coating for them. Castor oil also can be solidified by exposure to the electrons.

Bacteria and flies are killed almost instantly by the rays, but, as the rabbit escaped with only a slight burn, there seems small danger that it might be developed into a "death ray" to be used against human beings or, in fact, any large organism.

Exposure of various kinds of minerals produced a wide range of cold light. A lump of calcite, a colorless and transparent mineral, glows with a bright orange light, and the glow continues for several hours after exposure. Granite, a mixture of several minerals, glows with a variety of brilliant colors, some fading away immediately and others remaining for a long time. Numerous other materials can be made to change color.

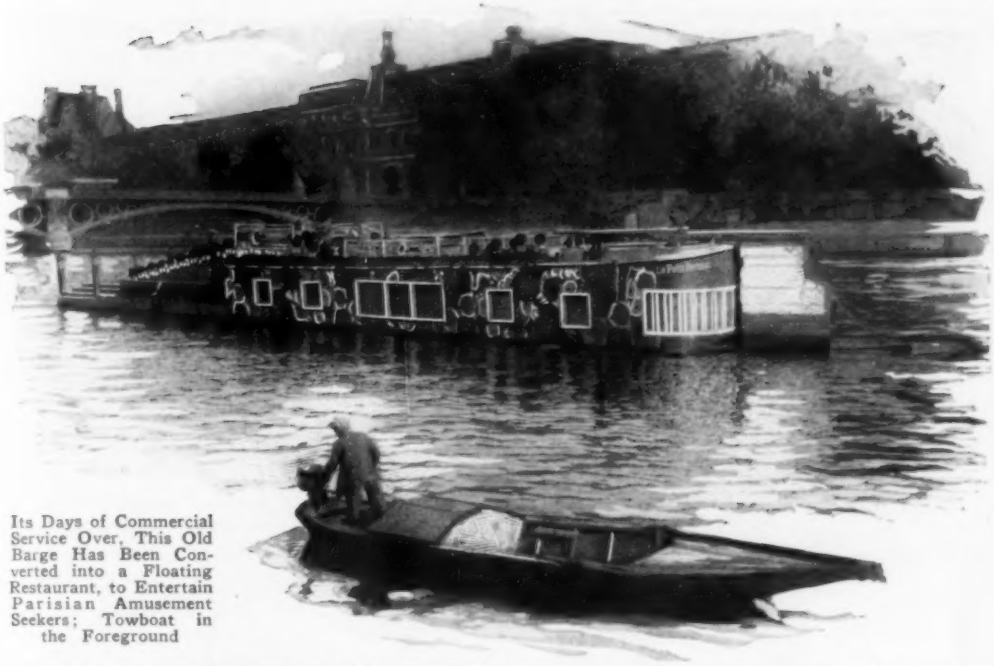
The tube is still a laboratory development, but even though no commercial possibilities are ever found for it, either in medical or industrial work, it is expected to prove invaluable in scientific investigations of electronic phenomena.

MARINES GUARDING U.S. MAILS CARRY MACHINE GUNS

Detachments of marines, equipped with a type of machine gun that can be fired from the hip, guarded the mails during and before the holiday season to foil bandits. The soldiers were sent with the cars and accompanied the trucks about

This Marine Has Landed and Is Ready for the Mail Bandits; a Corporal Equipped with Machine Gun

the cities. An advantage of the special gun is its light, compact form and its rapid fire, which enable one man to cope with several attackers.



Its Days of Commercial Service Over, This Old Barge Has Been Converted into a Floating Restaurant, to Entertain Parisian Amusement Seekers; Towboat in the Foreground

BARGE AS FLOATING CABARET POPULAR IN PARIS

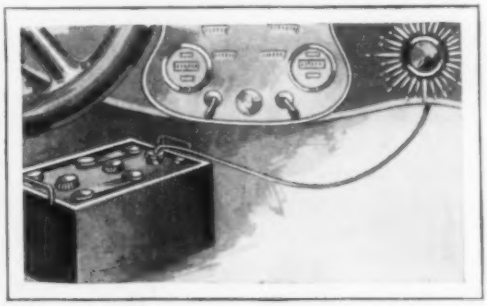
Variety in entertainment is enjoyed in Paris on an old barge which has been remodeled into a floating restaurant and roof garden. It is towed along the Seine or can be pulled to any desired spot for anchoring. Patrons are carried to and from shore by a tender with an outboard motor. The craft lies low in the water, so that the windows of the restaurant are only a few inches above the surface. Brightly colored furniture, potted trees, imitation mooring posts and a broad flight of stairs leading to the water's edge are features of the equipment.

AMERICAN DYE TRADE GAINING TARIFF REPORT SHOWS

More than ninety per cent of the total quantity of dyes used in the United States in 1925 was made in this country, and large amounts of the lower-priced colors were exported, the tariff commission reports. The output in coal-tar dyes of seventy-five firms was more than 86,000,000 pounds that year, an increase of nearly 18,000,000 pounds over 1924. Despite the large production, the number of firms making dyes has been reduced, chiefly owing to keen competition. The development of the industry has also been marked by the production for the first time in the United States of many vat dyes, direct-developed dyes and special colors for rayon and certain mixed fibers.

BATTERY LIGHT ON AUTO DASH TELLS IF WATER IS LOW

To prevent injury to automobile storage batteries, a light signal attached to the dashboard is automatically extinguished when the water gets below a certain level, so that a new supply may be obtained and trouble averted. The light also serves as a lamp for the instrument board and is easily installed.



Battery Water-Gauge Light Installed on Dashboard; It Goes Out When Water Gets Too Low

Straightened Course of Chicago River Is Indicated by Dotted Lines

TO TAKE KINKS OUT OF RIVER FOR TRAFFIC RELIEF

To permit easier passage between the north and south sides of Chicago, the south branch of the river is to be straightened at a point in the railroad-terminal district where it now makes a sharp turn. For years, this twist has restricted street traffic producing a "bottle neck" situation.

SAFETY INFLATER ELIMINATES TIRE GAUGE

Employing a testing gauge while blowing up the tire is not necessary with an inflater which may be set for the required pressure and automatically shuts off the supply when the tire has received enough. A bell rings while air is passing and stops when the tire is properly filled.

Insuring Correct Inflation without Use of Gauge; Bell Stops Ringing When Tire Is Filled

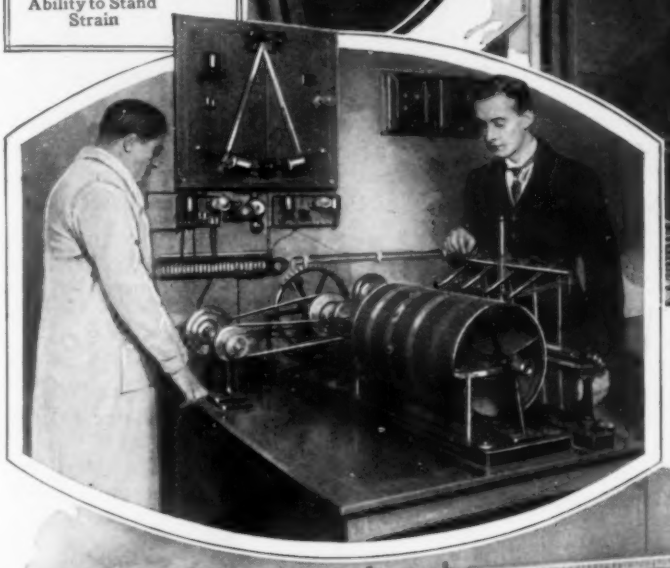
SCANTY QUARTERS HAMPER PATENT OFFICE WORK

Failure to provide an adequate building for handling the enormous patent business causes a potential loss of millions of dollars annually to American industry, according to Thomas E. Robertson, commissioner of patents. He points out that, although the patent activities at the present time are 450 times greater than when the office was created, no greater space is now available for storing application files and copies of patents. When the first office was constructed, only 200 or 300 patents were issued yearly. The present number totals more than 45,000 annually, while trade-marks and designs bring the number up to 70,000. Loss of efficiency, due to crowded conditions and the fire hazard, is a serious feature of the situation. During the last fifty years, the office has turned in more than $7,000,000 to the treasury and it is now practically self-supporting. Stored on the miles of shelving in the building are 50,000,000 copies of previously granted patents and thousands are added to this number each year. Applications which result in the grant of patents must be stored where they can be reviewed by officials of the office, and others.

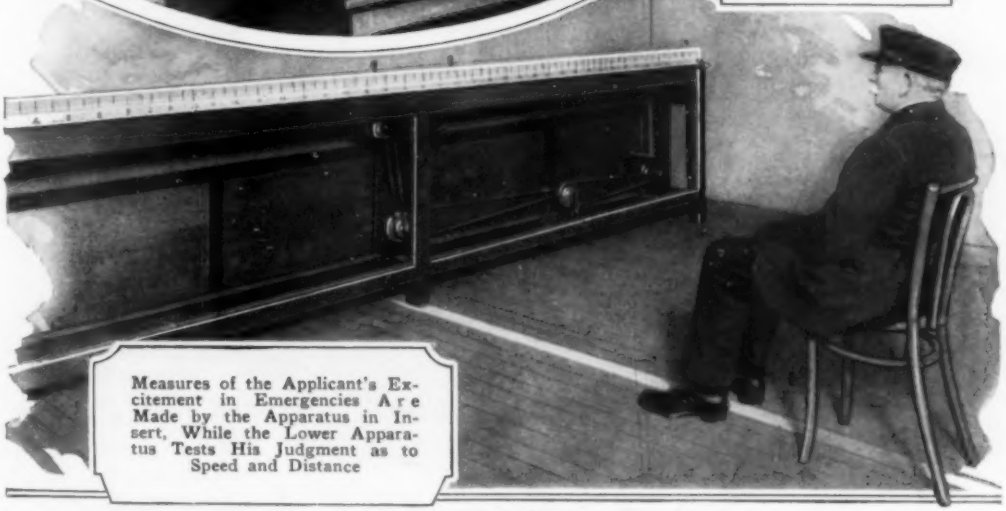
¶Lead weighs only about half as much as tungsten.

TESTS FOR MOTORMEN TO ASSURE PUBLIC SAFETY

Testing a Candidate's Ability to Stand Strain



Above Is a "Dummy" Car Platform on Which Motormen Are Tried, While the Examiner Records Their Reactions to Traffic Signals Suddenly Flashed in Front of Them



Measures of the Applicant's Excitement in Emergencies Are Made by the Apparatus in Insert, While the Lower Apparatus Tests His Judgment as to Speed and Distance

The Result of Four Months' Training at the Animal School; Wild Elk Broken to Harness and Hauling Dray

BIG ELK BROKEN TO HARNESS AT ANIMAL SCHOOL

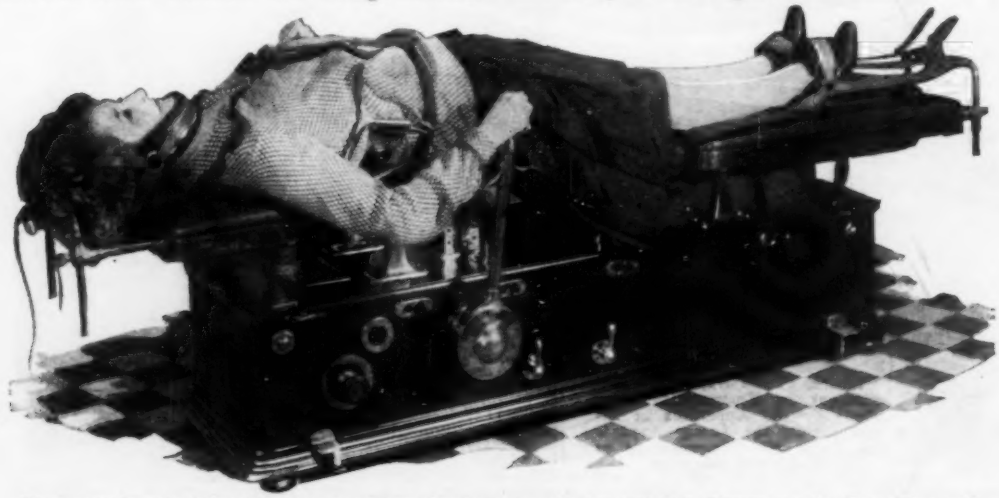
Wild and vicious animals, difficult to train for show purposes, are sometimes sent to a special "school" in an Ohio city, where its manager accomplishes the seemingly impossible in educating the beasts. The success of his methods is demonstrated by the accompanying picture of a large elk which was broken to harness in less than four months and was used to haul a dray about the streets. It lost most of its antlers during its struggles, but was otherwise uninjured. A coyote has been taught to work with trained dogs, and several other animals are being trained.

REDWOODS YIELD TANNING FLUID

Redwood forests in California may prove to be a source of wealth not now figured on if the findings of a university investigator are substantiated. He has discovered that the reddish heart of the trees contains tannic acid in such amounts that the wood promises to be an important source of tanning materials used by the leather industries. In some cases, the yield ran from seven to eight per cent and one test showed a content of twelve per cent. The tannin is said to be inferior to that of the tan-bark oak of California, at present the mainstay of the tanning activities in the state, but the greater availability of the redwood may offset this disadvantage, it is believed.

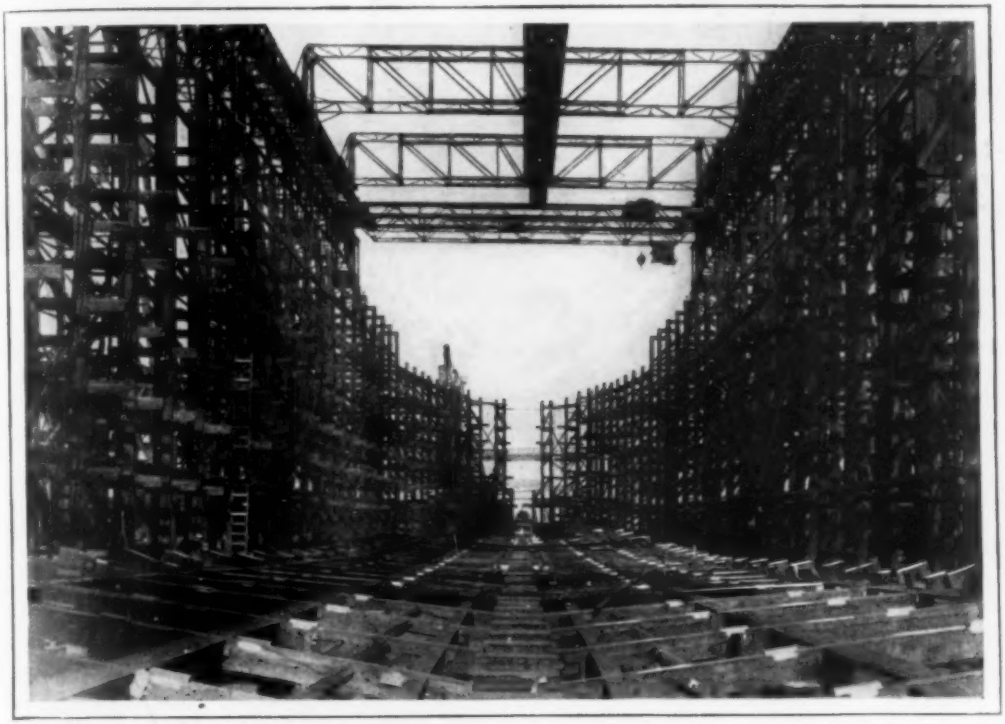
ELECTRIC STRETCHING MACHINE AIDS PHYSICAL CULTURE

Beneficial results are said to be obtained from an electrical stretching board introduced at a recent exhibition. It can be operated by the person using it and has lengthwise and side motions intended to exercise and stretch parts of the body that are likely to need special treatment.



Demonstrating the Electrical Stretcher That Has Both Lengthwise and Side Movements for Exercising and Strengthening Muscles; the User Maintains Control of the Action

U. S. BUILDS FIRST CRUISER UNDER ARMS TREATY



Ready for the Construction of the First Cruiser Since the Limitation of Arms Treaty Was Signed; the Huge "Nest" in Which the "Pensacola" Will Be Built

Construction of the U.S.S. "Pensacola," the first man-of-war to be built according to the provisions of the Washington limitation of arms treaty, is now under way at the New York navy yard. The vessel will have a length over all of 585 feet six inches and a displacement of 10,000 tons, the limit fixed by the agreement. Its normal draft will be nineteen feet six and one-half inches, and the estimated speed, thirty-two and one-half knots. Its guns will not exceed eight inches in size, but the treaty did not limit the number of guns that may be provided. By an act of congress, in 1924, the president was authorized to undertake, before July 1, 1926, construction of eight scout cruisers, carrying protection and armament suitable to their size and type, to have the highest possible speed and the greatest desirable radius of action and to cost, exclusive of armament, not more than $11,000,000 each. The keel was laid down on "Navy Day," October 27.

RAYS OF ARTIFICIAL SUNSHINE AID DENTAL TREATMENT

Rays of artificial sunlight have been found helpful in various medical treatments and now a special lamp has been devised to administer the rays to the interior of the mouth in dental work. A tube is held between the patient's teeth and the lips closed while the operator manipulates the apparatus.

Sunlight Lamp for Dental Treatment; Artificial Sunshine Is Directed through Tube

Mars' Latest Visit Leaves Riddle of Life Unsolved

Red Planet Probed by Watchers in Search for Clues That Life Exists on Its Surface

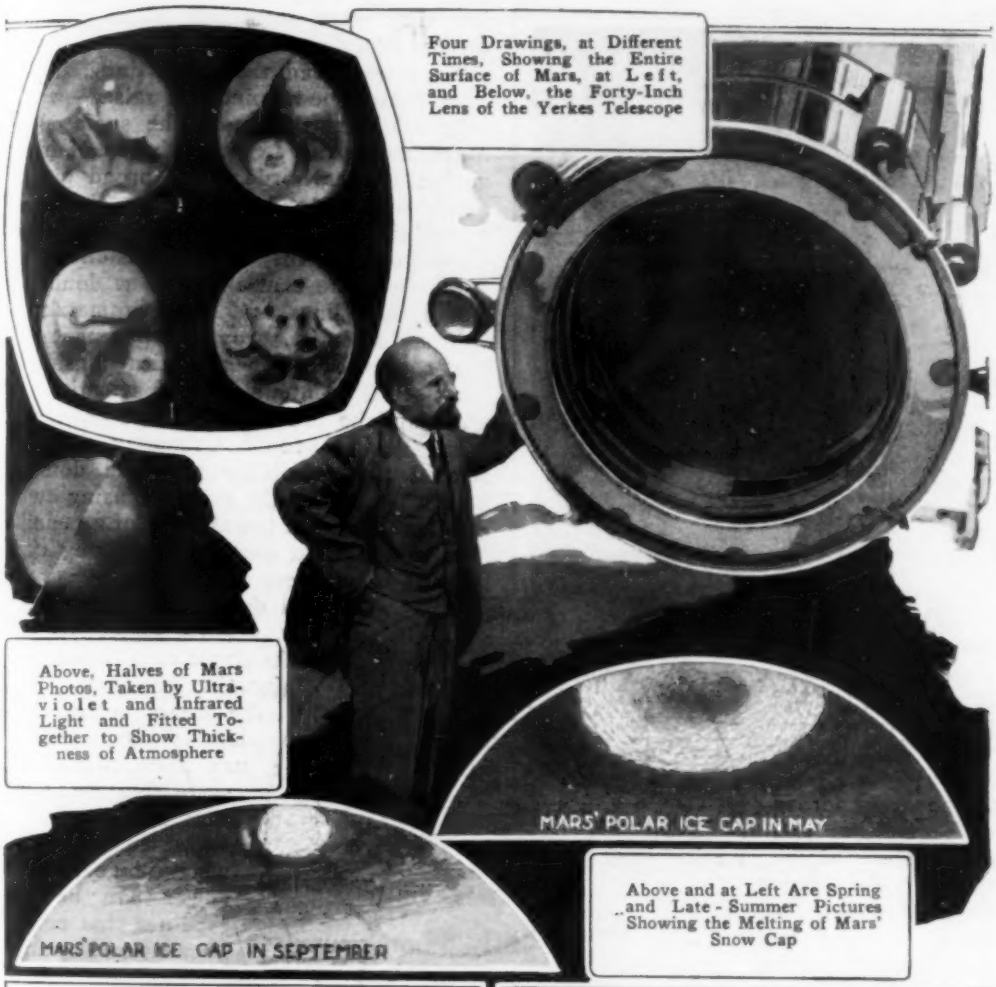
THE most intriguing mystery in the heavens—whether life exists on Mars—may be settled once for all within the next few weeks, when astronomers scattered throughout the northern hemisphere combine and compare the results of their latest observations of the big red planet. For two months they have trained their telescopes, cameras and spectroscopes on our nearest neighbor in the sky—nearest if you except our own satellite, the Moon—in a world-wide drive to solve once for all the question of whether man-made canals crisscross the planet, or whether the lines, which many have seen and some have photographed, are only an optical illusion that even fooled the cameras.

The occasion for the frenzied interest in Mars was its near approach to the earth, only 42,630,000 miles away, on October 27. It is true that this is several million miles farther than the distance to the planet in August two years ago, when it came within 35,000,000 miles of the earth, but on that occasion the planet was seen far down toward the southern horizon, not a favorable position for observers in the northern hemisphere. In spite of the difficulties two years ago of sighting through many extra miles of the earth's atmosphere, the astronomers definitely established that the canal marks were there, measured the temperature of Mars, weighed the oxygen in its atmosphere, and determined how much water a problematical Martian would have for daily drinking, bathing and shaving.

The establishment as a fact that Mars has both air and water proves that some sort of life may exist on the planet, but the Martian, if he does exist, resembles nothing we have ever seen, for the air he has contains one-third less oxygen than is found at the top of Mt. Everest, and the only man that ever reached that highest mountain peak in the world died there from lack of that vital element. And the water vapor in the Martian atmosphere is only six per cent of that found over Pasadena, Calif., below Mt. Wilson observatory, where the measurements were made, a condition that would indicate a desert drier than the wastes of the Sahara, with its surface parched and cracked, while, as for the temperature recorded, it has a daily range, in the Martian tropics, of from around ninety degrees below zero at midnight to about sixty degrees above zero at noon.

To meet such conditions, lack of air, lack of water and tremendous temperature changes, the Martian would need a detachable skin or coat of fur, tremendous lung capacity to breathe the rarefied air, and an ability like the camel to go seven days without a drink. His colossal lungs would have to be housed in an enormous chest, yet it would be supported by spindlelike legs, for his total weight, as measured on earth, would be much less than that of one of our people, since Mars, with a diameter of 4,200 miles, is only about half the earth's size and hence the attraction of gravity is only a fraction as great.

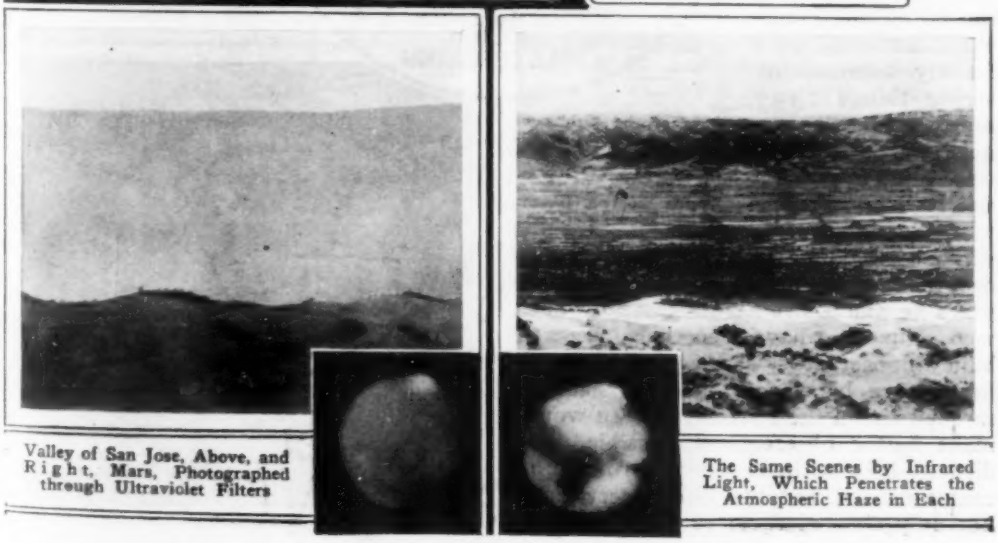
Proof of the existence of air and water and at least some warmth, however, is not proof that life does exist, so science prepared to concentrate last fall on two things,



Four Drawings, at Different Times, Showing the Entire Surface of Mars, at Left, and Below, the Forty-Inch Lens of the Yerkes Telescope

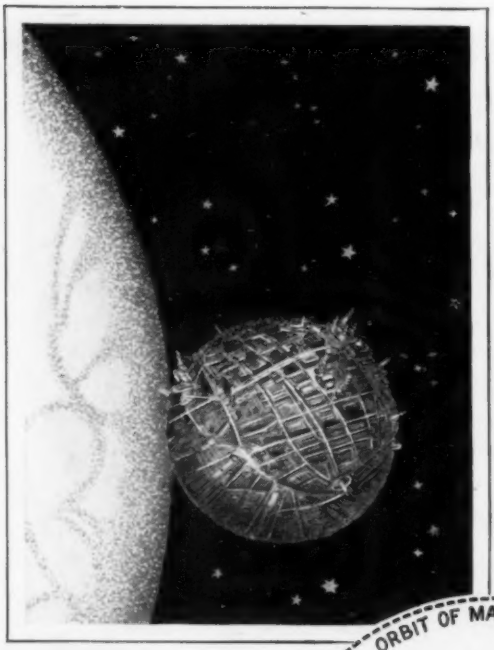
Above, Halves of Mars Photos, Taken by Ultraviolet and Infrared Light and Fitted Together to Show Thickness of Atmosphere

Above and at Left Are Spring and Late-Summer Pictures Showing the Melting of Mars' Snow Cap



Valley of San Jose, Above, and Right, Mars, Photographed through Ultraviolet Filters

The Same Scenes by Infrared Light, Which Penetrates the Atmospheric Haze in Each



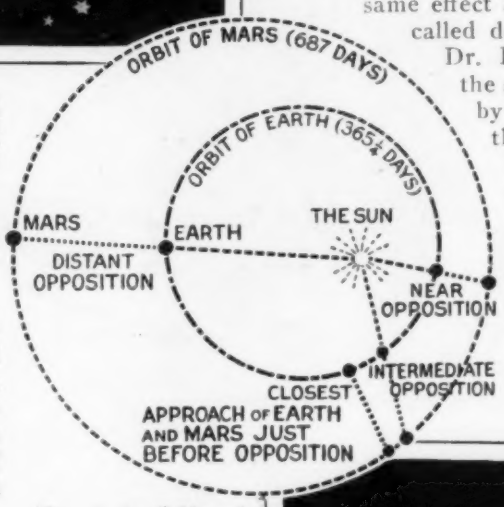
Mars' Smallest Moon, Ganymede, Only Seven Miles in Diameter, Would Just Accommodate a Good-Sized City, as the Artist Has Shown Above

the apparent spread of vegetation, and the mystery of the canals. The latter were for years a matter of doubt and their chief sponsor, the late Prof. Percival Lowell, was frankly accused of seeing things that didn't exist. The canals had first been discovered in 1877 by an Italian astronomer, Schiaparelli, while engaged in drawing the first map ever made of the planet. For a great many years he and Lowell were the only ones who claimed to have seen them. Lowell built an observatory at Flagstaff, Ariz., to help prove his theory, hoping that the rarefied air on the Arizona plateau would make better observations possible. He died in 1916 without having proved the canals existed, but the 1924 observations not only showed them to the observers, but they were accurately photographed for the first time.

No sooner had that been done, however, than a new point was raised—were they really markings on the surface of Mars, answering Lowell's theory of irrigation ditches bordered by broad green fields, which stood out against the surrounding desert and hence made them visible, or were they optical illusions?

Many of the canals appear as doubles, two parallel lines, and H. J. Gramatzk, a German scientist, proved experimentally that they probably were optical illusions. That set Dr. Kuhl, a Munich scientist, to work and he proved the single channels were illusions, too! Gramatzk demonstrated the possibility that the double canals do not really exist by using two candles to project the shadow of a pencil. The shadow had dark edges, giving the same effect as is seen in the so-called double canals.

Dr. Kuhl's suspicions of the single canals, aroused by the questioning of the double ones, led him to try to measure them, with the surprising result that he found the supposed canals were much narrower than the finest lines that could be measured by any



Map of the Orbits of Earth and Mars, Showing Why They Are Nearest at Certain Periods, and, at Right, a Sketch from a Photograph Showing Canals

existing instrument, a fact that led to the conclusion they were just illusions, too.

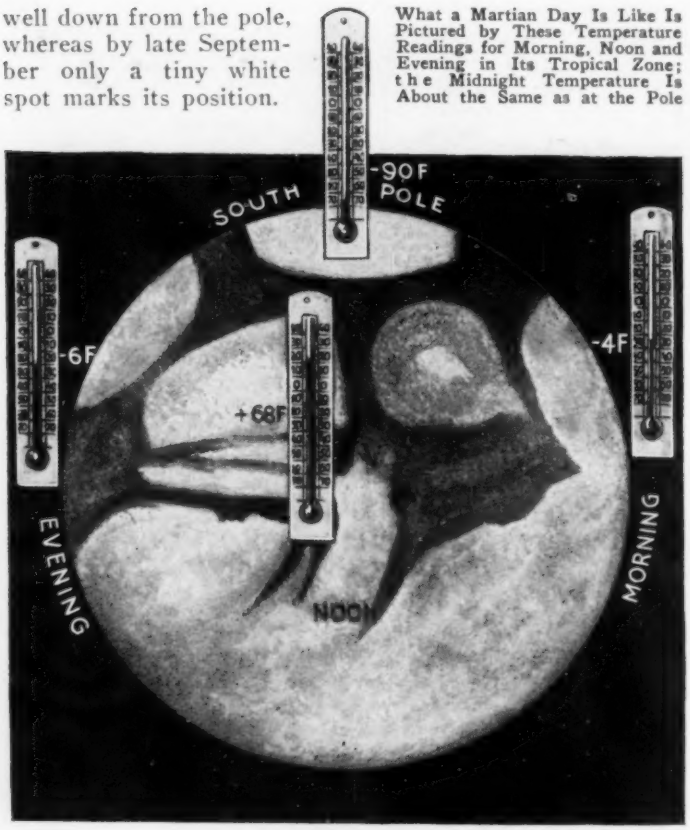
This theory, however, has failed to satisfy everyone, so the investigation continues. The canals apparently are straight, laid out along geometrical lines, and all the single ones, at their points of junction, are surrounded by large dark dots that might be cities or intensively cultivated areas.

Under a large telescope, Mars presents a fascinating study. The temperature observations made two years ago give a definite picture of what a day on Mars is like. When the sun rises over an equatorial land there, the morning is bitterly cold. Slowly the ground gets warmer, more rapidly, probably, than would be the case on the earth because the atmosphere is so much less dense and its vapor content so slight, that there are few clouds to impede the sun's rays. At noon the heat in the areas which astronomers have named seas and marshes reaches close to sixty degrees above zero, and in other sections, which appear lighter, with a reddish or yellow tinge, to about forty-five degrees. As the afternoon progresses the temperature falls rapidly. The disk, as the astronomer watches, changes color, white fogs from the rifts and abysses, which, in contrast to the plains, are reddish and give the planet its peculiar brick-red color, even when seen with the naked eye, rise and spread over the surface. The land becomes gradually yellower the closer sunset draws near, and as the sun sinks below the horizon, the temperature falls far below zero. At the poles grim cold rules always, with an ice cap, much like those at our own north and south poles, always present. At the south pole, which, at the time of the opposition in August, 1924, when the observations were made, had summer, the temperature nevertheless was ninety-four degrees below zero. On the big ice cap, the melting of which could be followed distinctly, curious light spots were seen, whose changes pointed to violent atmospheric disturbances.

An Artist's Conception, from H. G. Wells' "War of the Worlds," of the Kind of Life the Planet Mars May Support

The periodical recession and advance of the Martian ice cap was accurately photographed many years ago. In our late spring it is at its greatest, extending

well down from the pole, whereas by late September only a tiny white spot marks its position.



What a Martian Day Is Like Is Pictured by These Temperature Readings for Morning, Noon and Evening in Its Tropical Zone; the Midnight Temperature Is About the Same as at the Pole

Despite the very great range in temperatures the Martian world would not offer unconquerable obstacles to earthly explorers who had first become inured to our own north and south-pole extremes, though the cold on Mars exceeds somewhat anything they would experience on the earth. With such a large polar cap melting to supply water, it is even probable that sufficient moisture could be found to sustain them. The one insuperable difficulty to earthly men ever living on Mars is the scarcity of oxygen, but, while that bars them, it does not bar other forms of life, for insects and birds have been found as high up on Mt. Everest as man has ascended.

Life on Mars would at least have variety, for the planet has two moons to our one, and, curiously enough, one rises in the east and the other in the west! And one of them spins around Mars three times a day, so that it would be visible there both day and night.

The way in which so much has been learned about the neighboring planet, if you can call an object more than 40,000,000 miles away a neighbor, is a story in itself. The discovery of its atmosphere was due to an ingenious idea conceived at Lick observatory and executed by Prof. Robert G. Aitken and W. H. Wright. From their station on Mt. Hamilton they took pictures of San Jose, Calif., lying in the valley thirteen miles away. One picture was taken through a color screen that passed only ultraviolet rays, and the other through a screen passing infrared rays, at the other end of the spectrum. Then they took similar pictures of Mars and found that the same effects were obtained, the atmosphere in one case blurring the image, just as it blurred the image of the town, while in the other both showed clear. Finally, they cut the two pictures of Mars on a line drawn through the poles, pieced the half of one to the half of the other, and found that one picture was much larger than the other! The difference in size represented the thickness of Mars' atmosphere.

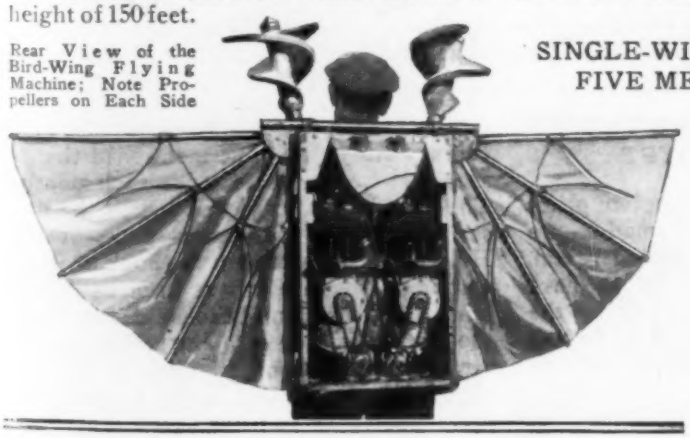
FIND STRANGE TEMPLE IN INDIA THIRTEEN CENTURIES OLD

Mysterious India has yielded another treasure to the historian in the ruins of a temple recently unearthed in Bengal. It is of a type distinctly different from that of other old structures, having been built of small bricks with mud as mortar. In spite of the ravages of time, the walls in some places were standing as high as 60 feet above the ground level, and the ornamentation of the temple was remarkably well preserved. Stone had been used sparingly, being confined mostly to the pillars

and pilasters, drain pipes and gargoyles in the shape of crocodiles' heads. The main part of the building occupied the center of a quadrangle where a mound, seventy feet high, remained. In plan, it resembled a huge Maltese cross, the arms of which were large staircases now hidden in the mound. The side walls of the stairway, and other parts of the structure, were decorated with figures of flowers, trees, rocks, snakes, animals and men.

MACHINE ON BACK MAKES MAN FLY LIKE A BIRD

What appears to be a partly successful imitation of bird flight applied to transportation has been demonstrated in the curious apparatus devised by an Austrian inventor. The rig is strapped to his back and includes two upright propellers which, on revolving rapidly, raise the rider from the ground. On each side are wings that open and close like an umbrella. By means of the propellers, the height of ascent is regulated and the landing negotiated. The mechanism is driven by a gasoline motor and is said to have carried the inventor a third of a mile and to a height of 150 feet.



Rear View of the Bird-Wing Flying Machine; Note Propellers on Each Side

Clearing the Bar Is Necessary with This Type of Standard, or It Will Fall; Elevating Lever under Stick

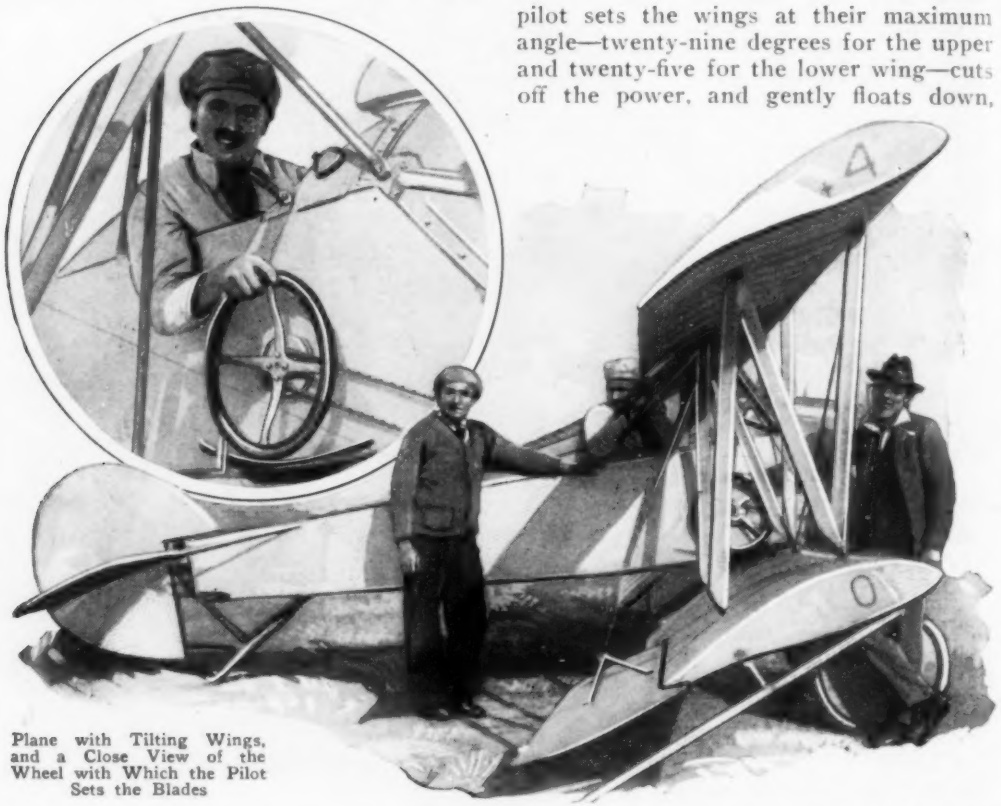
STRICTER TEST OF HIGH JUMPS IN NEW STANDARD

Jumpers must clear the bar of a new standard clean, or it will fall off and the leap will not count. The crosspiece is so adjusted that it topples at the slightest blow and cannot bounce back on the pegs as sometimes occurs with other standards. The new rig has been tested by athletes at various schools.

SINGLE-WIRE CABLE CARRIES FIVE MESSAGES AT ONCE

Five telegrams can be sent at the same time at a speed of 1,200 letters in one minute on the single-wire cable to Germany. It stretches from Emden to the Azores, where it connects with the New York cable, forming the first direct telegraphic connection with Germany since the war.

TILTING WINGS GIVE BETTER CONTROL OF AIRPLANE



Plane with Tilting Wings, and a Close View of the Wheel with Which the Pilot Sets the Blades

Designed to move in any direction or from one altitude to another with ease, yet to remain horizontal to the ground at all times, a biplane with movable wings has been built by A. A. Merrill, at the California institute of technology. It already has flown 1,100 miles. One of the most remarkable feats of the plane is its ability to land at a speed of less than five miles an hour. To accomplish this, the pilot sets the wings at their maximum angle—twenty-nine degrees for the upper and twenty-five for the lower wing—cuts off the power, and gently floats down, much in the manner of a bird. The plane "takes itself off" the ground in the same manner. The pilot sets the wings at the desired angle and settles back comfortably and waits for it to leave the earth. Merrill claims his plane is stable under any and all conditions; gusts cannot upset it; it cannot be stalled to the point of losing control and it will not go into a dreaded nose dive unless the pilot so wills it.

ORIGIN OF BIRTHSTONE TRACED TO ANCIENT EGYPT

As early as 4000 B.C. an Egyptian priest wore a breastplate of twelve small stones or crosses, carvings of the period reveal, and this ornament is believed to have some relation to the plate worn by the High Priest Aaron as described in the book of Exodus. It was from this arrangement of stones that the idea of birthstones, one for each month in the year, is believed to have been derived. In the first century A.D., Josephus mentioned that a special stone was dedicated to each month. The idea is further developed in the description of the foundation stones of the Holy City as recorded in the book of Revelation. Their order was used to determine the succession of the natal stones for the months of the year. The twelve stones are also in distinct relationship to the signs of the zodiac and, in this connection, had significance in astrologers' practices.

BURNING FLAME UNDER WATER MAKES STEAM SWIFTLY

Promise of a more efficient way of generating steam is seen in a combustion method by which a flame is made to burn under water, transferring its heat directly and thus eliminating losses. The system has been developed by English inventors and suggests the possibility of wide application on both land and sea. The apparatus is simple, requires about one-tenth the space of the ordinary boilers of a vessel and is said to generate steam within a few minutes after combustion. No smoke, soot or residue is formed, so that no funnels will be necessary and sea water can be used as no scale accumulates. The fuel is oil, although other materials can be employed, it is believed. Air is supplied to the flame under high pressure. The blaze is regulated by turning a wheel.

FREEZER HOUSES ICE-CREAM AND CANDY STORE

Built in the shape of a large ice-cream freezer, a refreshment store in a western city is a conspicuous wayside feature. Visitors are attracted by the huge handle which turns in realistic manner. It is counterbalanced to minimize vibration and is operated by a small electric motor.

To Attract the Eye of the Hungry and Thirsty; Confectionery Store Built as Freezer

Cane Open for Use as Ukulele, and Closed as Walking Stick; Strings Are Tuned by Turning Coin in Slot

UKULELE CONCEALED IN CANE IS TUNED WITH A COIN

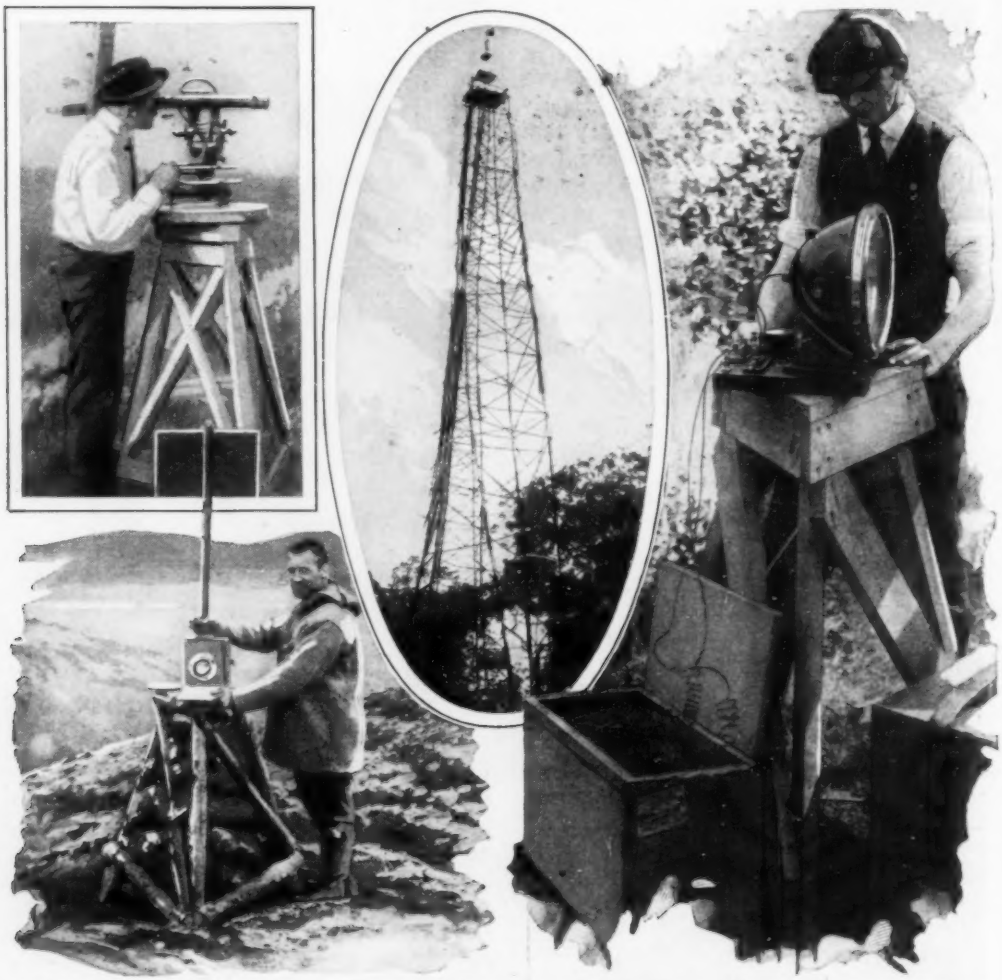
Walking stick and ukulele are combined in a novel and serviceable article introduced by an eastern inventor. The strings are behind a concealed cover in the cane, and they are tuned by inserting a coin in a slotted key and twisting it. A mandolin pick is used to play the instrument and best results are said to be obtained by resting the ukulele partly on a solid body.

AFRICA SAND BLOWN TO FRANCE FALLS WITH RAIN

Fine particles of yellow sand were found in rain that fell in southern France during severe storms not long ago. Apparently, the grains had been swept across the Mediterranean from Africa by the strong winds which blew steadily for more than two days. The carrying power of air currents is likewise demonstrated after severe volcanic eruptions. Some of the finer dust from such disturbances has been carried entirely around the world.

¶The sweetest bird singers have sober-colored plumage.

HOW FAR CAN YOU SEE?—UNCLE SAM GIVES ANSWER



Fixing Your Location on the Map; Geodetic Engineers with Sun Reflectors and Telescopes; in the Center Is an Observation Tower, and at the Right, the Auto Light for Night Work

An ordinary automobile-headlight reflector holds the world's record for visibility of a low-candlepower light, according to a recent announcement of the coast and geodetic survey. Two such lights placed on a mountain top in Arizona were seen with the unaided eye by an observer on another mountain just a few feet less than 153 miles away. The long-distance sight was part of the regular work of the survey in accurately locating every part of the country, as a basis for correcting existing maps. Part of the location work is done by triangulation surveys, in which three points are used to take bearings, from each to the other two, so as to fix their exact location in reference to one another. Accurate observations have been made in the daytime over even greater distances. The longest geodetic ray ever used in the United States was 192 miles, between observers stationed on Mt. Shasta and Mt. Helena, Calif. They worked in daytime, using sun-ray apparatus in which light was reflected from twelve-inch mirrors, the observers picking up the rays from the distant station. Even longer lines have been run in the Himalayas of India, one of them exceeding 200 miles, but there the observers

simply sighted at the distant mountain peak as it stood out in quite distinct relief against the sky. Recently French engineers succeeded in linking the island of Corsica, birthplace of Napoleon, to the mainland by a triangulation survey in which several long rays, one of nearly 150 miles, were used. On one exceptionally clear night lights from projectors on five different mainland peaks were seen clearly and bearings taken from all of them. The bulbs used by the American surveyors are operated from dry cells.

GOGGLES ARE HINGED TO WELDER'S HELMET TO SAVE TIME

For welders, stonecutters, and others who use goggles, a combination of helmet and eye protectors has been devised. The goggles are hinged to the headpiece, which is of fiber material, worn as a cap and made secure by an adjustable strap at the rear. When not in use, the goggles are swung back and rest upon the top of the helmet. The wearer is spared the trouble of taking them off and searching for them again, and there is little danger of dropping or breaking the glasses. They can be adjusted to fit snugly. The entire outfit is light in weight and the material used resists both heat and electricity.

Combination Helmet and Goggles, Showing Hinged Support for Glasses Which Can Be Swung on Top

Steering Wheel and Part of Gear on Racing Car of Exceptionally Narrow Design to Decrease Wind Resistance

AUTO RACE DRIVER SITS INSIDE OF STEERING WHEEL

Reduction of wind resistance has become increasingly important in designing racing automobiles and to save a few square inches of head area, makers sometimes go to amazing lengths. An illustration of this is seen in a racer that appeared recently in France. It resembles a "knife on wheels." It was just engine-width and no more, and the steering wheel was fashioned so that the driver could sit with his legs through it, as though inside a hoop.

MAGNETIC STREET-CAR BRAKES HELP PROMOTE SAFETY

Electricity is not only used to propel street cars but to stop them. Magnetic brakes in the form of shoes suspended about two inches above the tracks have been devised. They are released by means of air pressure and are magnetized at the same time by electric current from the wires. In contact with the track, the shoes take a firm grip and are said to bring the car to a stop in one-third less the distance air brakes alone would do it.

Measuring the Strength of a Swimmer's Strokes; Meter in Use on Pacific Coast Beach

FORCE OF SWIMMERS' STROKES MEASURED BY METER

Like many other sports, swimming is being reduced to a fairly accurate science. In line with this development is a meter introduced on the Pacific coast for measuring the force of a swimmer's arm and leg strokes. It is mounted on a tripod and has a dial that registers up to 100 pounds. A line is attached to the swimmer, allowing plenty of slack for freedom of action. The pull on the cord as the stroke is made sends the arrow up to the figure giving the force of the movement.

EFFECT OF NOISE ON WORKERS INVESTIGATED BY STUDENTS

Is the noise of the big city injurious to health and does it lower the efficiency of workers? Students at Colgate university are seeking answers to these questions by a series of tests in a laboratory under the direction of a psychology professor. To imitate the sounds of the streets, a noise-making machine is being used. It automatically blows a siren, causes a gong to ring at varying intervals and a smaller bell to tinkle, while an assortment of nails and screws, crashing around inside a rotating six-sided box, adds to the din. The subject is a typewriter operator. The number of strokes made in a given time and the percentage of errors are recorded first without the noise and then with the racket. Tests will also be made to determine what physical effort was required to combat the strain of the noise. Other investigations are being made as to the effects of special wallboards and other materials for deadening sounds.

DOLLS PLAY FOOTBALL AT TOUCH OF LEVER

Played on a miniature field with two opposing teams of eleven "men" each, a mechanical football game is said to afford participants opportunities for showing skill and enjoying some of the thrills of the real game. The figures are operated by means of a lever which causes the movable leg of each man to kick. A small round ball is used, and the field is so constructed that the ball always comes to rest at the kicking foot of the player. This is made possible by slight depressions at each of these points and high spots on the rest of the field. Two persons play

When Levers Are Manipulated, Doll Figures in Cabinet Perform a Game of Mimic Football

the game, one managing each team. One of the figures on each side plays a guard position between the goal posts to prevent a score. It moves back and forth under lever control when the opposing team kicks.

MEMORIAL BRIDGE IS FEATURED BY CURVE

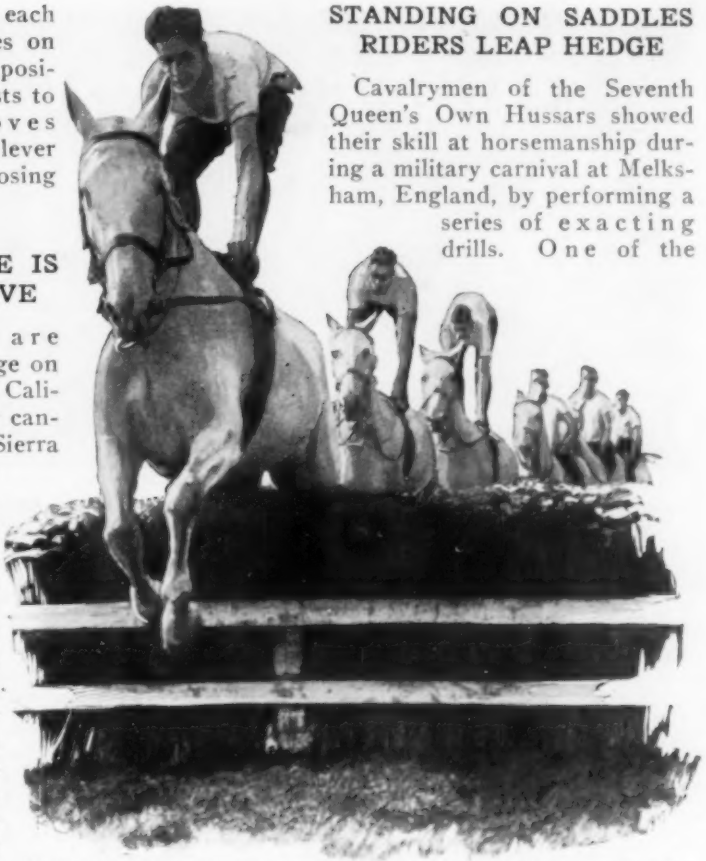
Sentiment and skill are linked in a concrete bridge on the Victoria highway in California. It spans a rocky canyon at the summit of the Sierra Nevada, 6,000 feet above the floor of the Sacramento valley and not far from the scene of a tragic episode of pioneer days. The site overlooks Donner lake, where a party of emigrants were snowed in during the winter of 1846-47, suffering severe hardships and many deaths. The bridge has been dedicated to the memory of these early travelers, three of whom, then infants, are still living. The structure is considered interesting from an engineering standpoint because it describes a curve in crossing the canyon.

ELECTRIC GRINDER FOR SKATES RUN FROM LIGHT SOCKET

Adaptable to all kinds and makes of skates, with or without shoes, an electric sharpener operated from the lighting socket, is said to grind an accurate and well-finished edge in little time. A feature of the apparatus is that it permits lengthwise sharpening, producing the correct degree of concavity without the undesirable effects of cross-grinding.

STANDING ON SADDLES RIDERS LEAP HEDGE

Cavalrymen of the Seventh Queen's Own Hussars showed their skill at horsemanship during a military carnival at Melksham, England, by performing a series of exacting drills. One of the stunts was to stand upon the saddles as the horses jumped over a hedge. Although grips were provided for fingerholds, the feat required steadiness and strength. The orderly line of mounts and men was not broken.



Matched in Color and Skill, Horses of the Queen's Hussars and Their Riders in an Exhibition Drill

WRONG COLOR OF WALLPAPER INJURIOUS TO HEALTH

Illness and domestic discord may result from using the wrong color of wallpaper or paint in the home, according to an eastern manufacturer. Because of its vivid shade and its vibrations, red has an injurious effect on some nervous systems, it is said, leading to the provocation of quarrelsome natures and even more serious ills. Some colors are comforting and others are disturbing. Hence, in a home, care should be taken that the favorite color of one is not unpleasant to another.

What Do Your Hands

Dr. Katherine M. H. Blackford, Who Applies Character Analysis to Fitting People into Right Work

By FLOYD TAYLOR

IS your thumb pliable so that it can be bent back from the joint, or is it stiff and unyielding? The form of your thumb may indicate what work you are best suited for, and whether or not you are in the wrong job.

Dr. Katherine M. H. Blackford, who has studied character analysis for twenty years and since 1912 has been analyzing men and women to fit them to their jobs, says a man's thumb may tell her more about his character than he can himself in half an hour of talking.

The man with a stiff, unyielding thumb, she says, has a stiff and unyielding character. The man with the pliable thumb has more adaptability and a more flexible will. If he cannot get what he wants in one way he will try another; he will compromise and use diplomacy to gain his ends. A thumb set high up and close to the palm indicates a primitive mind, according to Dr. Blackford. She says the skilled man has a thumb set low, fixed on his hand so that it is easy for him to grasp things. An undeveloped, short, stubby thumb indicates to her low will power and low intelligence.

Dr. Blackford trained herself to be a physician. For years she was puzzled by her inability to understand people, to know what types they were and why they succeeded or failed. She finally gave up the practice of medicine and made a trip around the world to study racial types, returning to continue her studies in the United States. Since 1912, she has devoted herself to personnel problems of corporations, her clients including a large mail-order house, a life-insurance company, one of the best-known power companies, and a large textile firm.

She organizes personnel departments for such companies, where all the work of employing, paying, advising and discharging is done. Dr. Blackford declares that not more than two per cent of the men engaged by these personnel departments are discharged. Men employed are assigned to jobs which their physical characteristics indicate they are able to do. If a mistake is made, the case is studied again and the employe given some

Across the Top, from Left to Right, Are Four Pairs of Hands, Those of a Laborer, an Assistant Sales Manager, a Bank Teller and an Engineer, All Showing Aptitude for Their Particular Work

other work. He is never discharged unless there is no job in the plant in which his abilities can be used to advantage.

Dr. Blackford insists there is some place in the world for every man; many have serious deficiencies, she admits, but all have special ability of some sort which can be used. Corporations employing hundreds or thousands of men save extraordinary sums by careful personnel work. A high employment turn-over is expensive; it can be avoided by placing the right man in the right job.

"Everything about a man counts in determining his abilities," Dr. Blackford says. "In physique, the convex structure is the positive principle and the concave the receptive principle. A tall man is not suited to stooping, so you will find most of the men handling shovels or construction jobs are short men. The short man is quicker in motion than the tall man.

"You will find that the majority of executives are stout. There is a direct relation between the desire for nourishment and the desire for money.

"Men who have raised pads at the ends of their fingers, just below the tips, are sensitive to their environment. The little mounds indicate that a man is more sensitive to pain and to all impressions.

"One man may be silken in texture, with fine hair, sensitive pads on his fingers and fine features. Another may be coarse like canvas. You use the silken man to do fine work and the canvas-like man to do work of heavy nature.

"Some work requires positive energy, the driving power to get things done, some requires a slow, enduring pace. If a man has high cheek bones and a nose which

Gov. Al Smith, Being a Blond, Likes Variety and Change; His Large Convex Nose Indicates Energy, and His Long, Full Back Head Shows Sociability, Says Dr. Blackford

Gen. Pershing's Convex Upper Face Shows Energy and Power of Observation; the Concave Lower Part Endurance and Tenacity, and the Length of the Head, from Chin Diagonally Backward, Indomitable Will

is convex when seen in profile, he has this positive energy. If he also has a high forehead and a large head and is a man of fine texture, he can best use his energy in mental work. If his forehead is low, his shoulders broad, his waist small and his texture coarse, he is best suited for physical work.

"The Anglo-Saxon has a high, long, narrow head. He is a pioneer and is progressive and ambitious. If you want a man with these qualities pick a high-browed man, with a long, narrow head. If you want a man to be cautious, careful, farseeing, a man who will work slowly and thoroughly, find a square-headed man. If you need some one for dangerous work, who is optimistic and willing to take chances with his life, look for a round-headed man.

"You will find that a man who has a hard hand has a hard head. The man with a soft hand is impressionable. He can't see people suffer and be unhappy without feeling it."

Some years ago, Dr. Blackford was called in by a cement company which had been producing inferior cement despite every effort to improve the product. Constant chemical tests are necessary to make good cement, and Dr. Blackford asked who was the company's head chemist. She was told by the president of the company that he was a man of exceptional ability. The chemist was called to talk to her. She noticed he had extremely short fingers.

"Can you ever make an experiment twice and get the same result?" she asked him.

He admitted he could not. She found he was a theorist able to convince others of his knowledge, but unable to do practical work. The company obtained a man of practical ability as head chemist and the other was advised to find work as a teacher.

Dr. Blackford can tell the approximate age of a man by examining the skin on his hands. If a bit of skin on the back of a young man's hand is pinched between the fingers and lifted up it will snap back into position quickly when released. If he is old, it will fall back slowly.

"If a man comes to me and says he is forty when his skin indicates he is fifty," Dr. Blackford says, "I know either that he is fifty or that he has been living too fast."

A man of the brunet type who matures early mentally, according to Dr. Blackford, is likely to keep his youth physically until late in life. The blond lives faster than the brunet. He expends more energy; he doesn't conserve his strength. The blond is keyed higher and moves more rapidly. On a job which requires speed, a blond will do better work than a brunet. For fast work you would want a medium-sized compactly built blond, whose face, in profile, is convex.

Dr. Blackford points out that many men,

including some of the most famous in history, have been failures in one or more fields before they went into the work in which they ultimately found renown.

"Lincoln failed as a retail merchant," she says. "Grant failed as a farmer. Ford never earned more than $150 a month until, at forty, he became an inventor and manufacturer. Hawthorne was a mediocre and poorly paid clerk until after he became a novelist, to name only a few out of many examples."

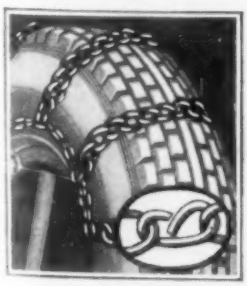
Going back to hands again, take the four pairs shown on the first pages of this story. The laborer's hands are typical, short and stocky with a heavy palm, fingers large and coarse, showing little sensitiveness.

The assistant sales manager's hands are those of an executive, with strong thumb, well balanced as a whole, with ability to grasp, and indicate a strong will.

The bank teller's hands are delicate, of fine texture, the crooked fifth finger indicating diplomacy, while the short nails show critical judgment.

The engineer's hand is in the analytic class, the thumb is flexible, showing intelligence, and the second joints are knotty. The raised pads at the ends of the fingers show the owner is a sensitive man.

AUTO CHAINS QUICKLY MENDED WITHOUT TOOLS



To simplify the task of mending the auto tire chain, easily inserted extra links which are quickly hooked in place and closed permanently by the weight of the car, have been introduced. No tools are needed for the attachment of the links.

Maj. Goodsell, Champion Single-Scull Oarsman, Can Easily Carry His Boat on One Shoulder; the Craft Weighs Eighteen Pounds and Is Almost as Fragile as an Eggshell

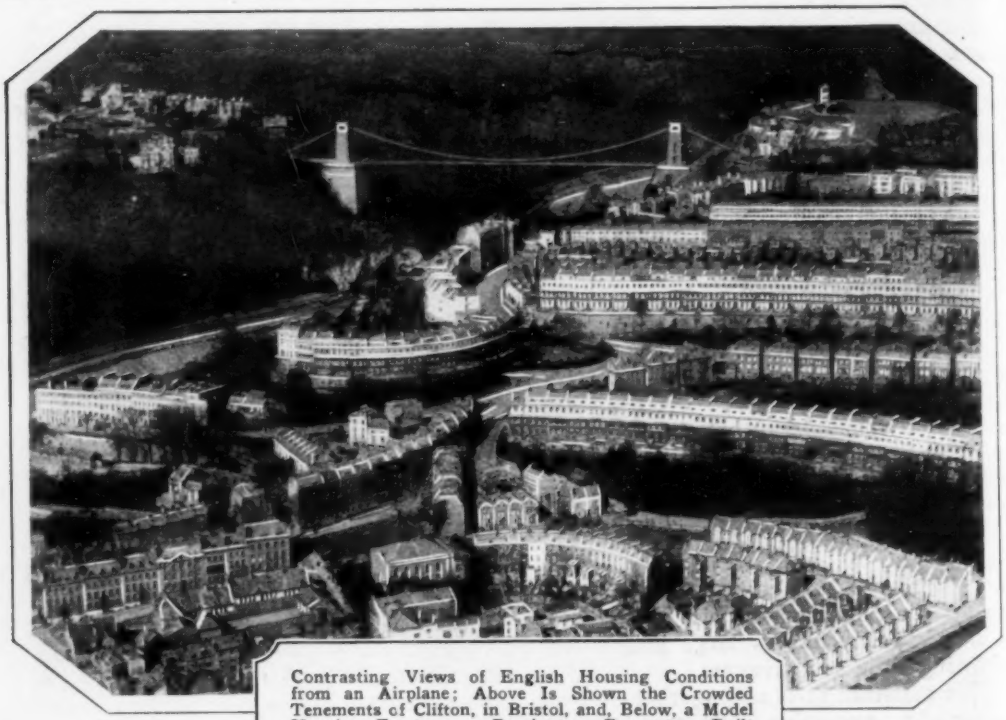
OARSMAN'S SCULL FOR RACING WEIGHS EIGHTEEN POUNDS

Lightweight equipment is an important factor in boat racing. This is illustrated in the fragile "shells" employed in rowing contests. A false move send an oarsman's foot through the craft and, although one of the boats will easily hold a crew of eight men when on the water, the utmost care must be exercised in handling them to prevent damage. The scull illustrated weighs only eighteen pounds.

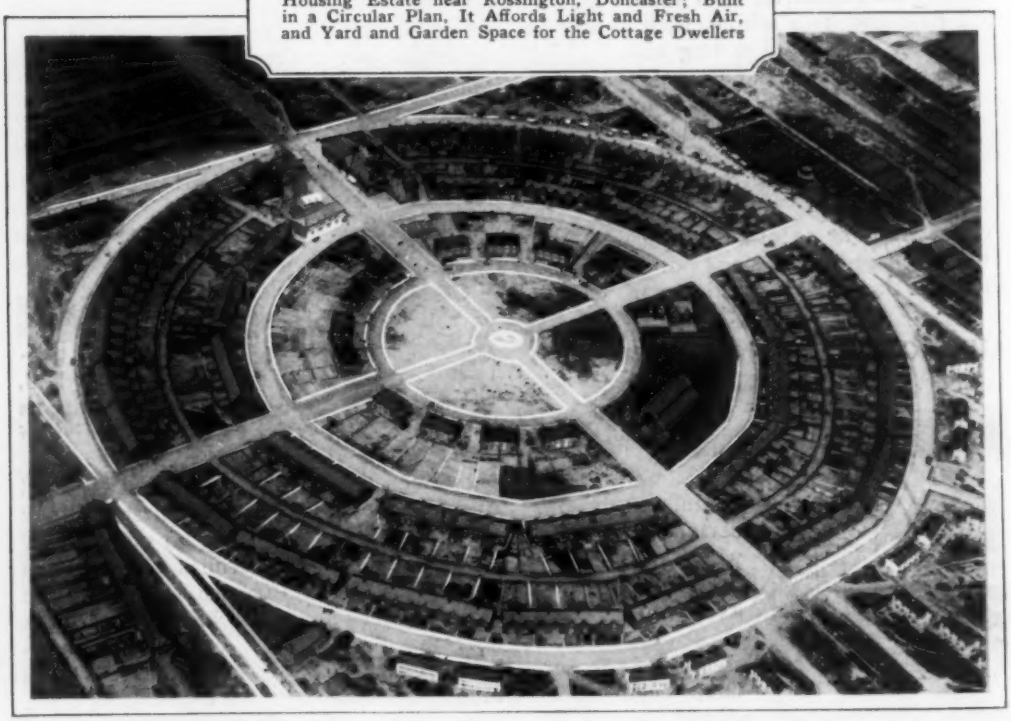
POLICE-DOG AIDS PASSING OUT OF USE

Of New York city's famous police-dog patrol, there are now but three members remaining from the original squad of thirty-five. The passing of the dogs is laid, not to their inefficiency or unreliability as home protectors, but to the difficulties of keeping them in good training. Few patrolmen to whom they were assigned understood dogs. They were first assigned to duty, in 1908, following an outbreak of robberies and other crimes in suburban districts. Within a month, they had been largely instrumental in bringing about a decrease of ninety per cent in the number of crimes in the suburbs. They were taught to catch fugitives by jumping upon them and holding them until the arrival of the patrolman.

MODEL VILLAGES TO SOLVE ENGLISH HOUSING EVIL



Contrasting Views of English Housing Conditions from an Airplane; Above Is Shown the Crowded Tenements of Clifton, in Bristol, and, Below, a Model Housing Estate near Rossington, Doncaster; Built in a Circular Plan, It Affords Light and Fresh Air, and Yard and Garden Space for the Cottage Dwellers



TEAR GAS FAILS TO STOP BEARS IN YOSEMITE

Depredations of bears in Yosemite national park upon the cabins of workmen and rangers, have become so serious that the national-park service is seeking a means of curbing them without injury. In an effort to discourage the bears, or put them to flight, experiments with tear gas were recently conducted in co-operation with the chemical warfare service. A small black bear was chosen as the victim for the experiment, and a heavy concentration of the gas was given him. It apparently caused the bear no discomfort whatever. He did not even blink. It previously has been demonstrated that horses and mules are indifferent to the gas, probably because they have no tear glands. Visitors to Yosemite find the bears among the most interesting of the park's wild life, and during the travel season they are well fed at the hotels and camps, as well as by visitors. By the time the hotels close the bears have become fat and lazy, and begin stealing slabs of bacon and other food, even though this may involve breaking a window or tearing a hole through a wall. With the apparent failure of tear gas, the park authorities are seeking other means of holding the bears in check without driving them out of the park.

Courtesy The Graphic

Sample Hat and Flowerpots Made from the Pulp of Pine Wood at an English Factory

HATS MOLDED OF WOOD PULP FOR ENGLISH MINERS

Hats, flowerpots, dishes and many other articles are being fashioned from pinewood pulp at an English factory. The material takes a wide variety of finishes and can be waterproofed. Helmets for miners are said to afford protection against falling rock. They are lighter than metal and not easily broken.

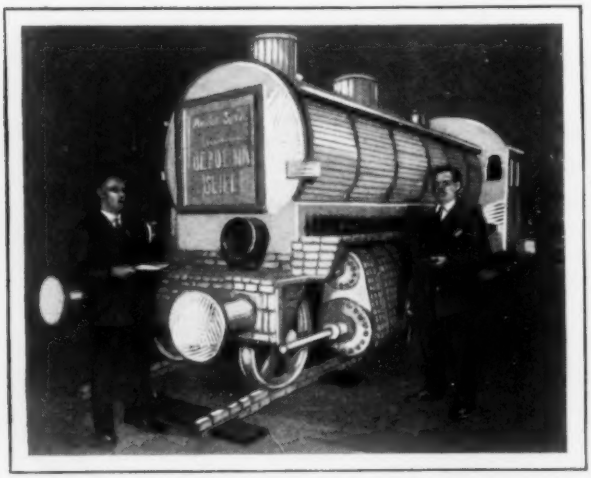
MIXER MAKES FOAM STREAM TO SMOTHER FIRES

From a water hydrant and a pumping engine, a stream of fire-smothering foam is obtained through a mixer into which a powder is poured to form the thick substance. In contact with the water, it undergoes a chemical change which produces the foam. As much as 600 to 700 gallons can be delivered to the fire per minute, depending upon the water pressure. This system eliminates the use of special units of apparatus, and it can be put to work as quickly as a line of hose.

Pouring Foam Powder into the Mixer; the Smothering Stream Is Forced through Hose at Right

BEES NEEDED TO HELP APPLE CROPS IN MAINE

If apple growers in Maine are to make money in the future, more bees must be raised in that section, according to experts. A small crop last season was ascribed to two main factors, cold, damp weather during the blossoming period and the lack of sufficient pollination, due to the scarcity of bees.



Model Locomotive Made of Soap Bars for a Berlin Exposition; Rails Are of Same Material

LOCOMOTIVE MODEL IN SOAP FOR BERLIN SHOW

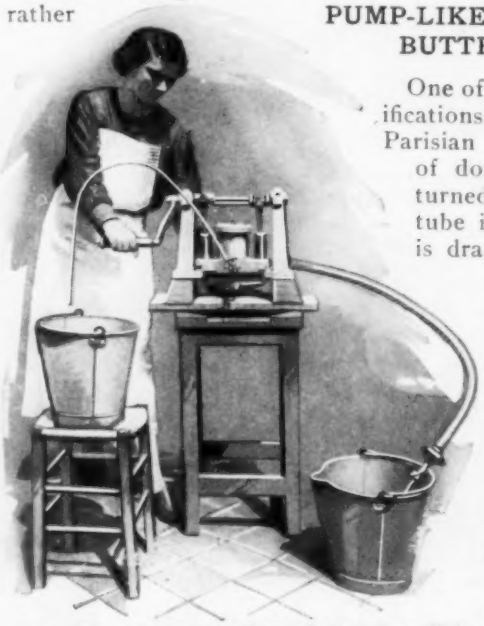
Thousands of cakes of soap of many different shapes and sizes were used at a Berlin exposition in fashioning a large model locomotive. The rails, too, were of soap.

THIRTY BILLION TOOTHPICKS MADE YEARLY IN U. S.

Toothpick making, at first thought, would seem to be a rather insignificant industry, but six large factories are kept busy in the United States to supply the demand, and the business is a highly specialized one, demanding the services of skilled men and intricate machines. The picks require the choicest part of white-birch logs. What is left is made into other articles. Hence, the toothpick, as is often supposed, is not a by-product but yields material for other things. The ideal season for the making of toothpicks is from December to April, when the sap is not running and can be more easily dried out, to prevent staining the wood. The bark of the trees goes for fuel, the "white sap," or cream of the log, is made into picks, and the "red heart" is used for other purposes. Logs are from six to sixteen feet long and are first cut into two-foot sections which are shaved to even cylindrical forms. They next go to the veneer lathes which shave them into long strips as wide as a toothpick is long. The strips are wound upon spools like ribbon and then passed through a chopper, a rapidly moving unit which has two sharp knives that cut out some 9,000 picks per minute. There are usually from twelve to sixteen of these machines to a battery. After they are cut out, the toothpicks are deposited in a huge steel oven where they are dried. The polish is applied by tumbling them about in a slowly turning steel cylinder, 110 feet in diameter. They are straightened by shaking, so they can be easily packed in the little boxes of which it takes some ninety-six to fill the ordinary shipping case.

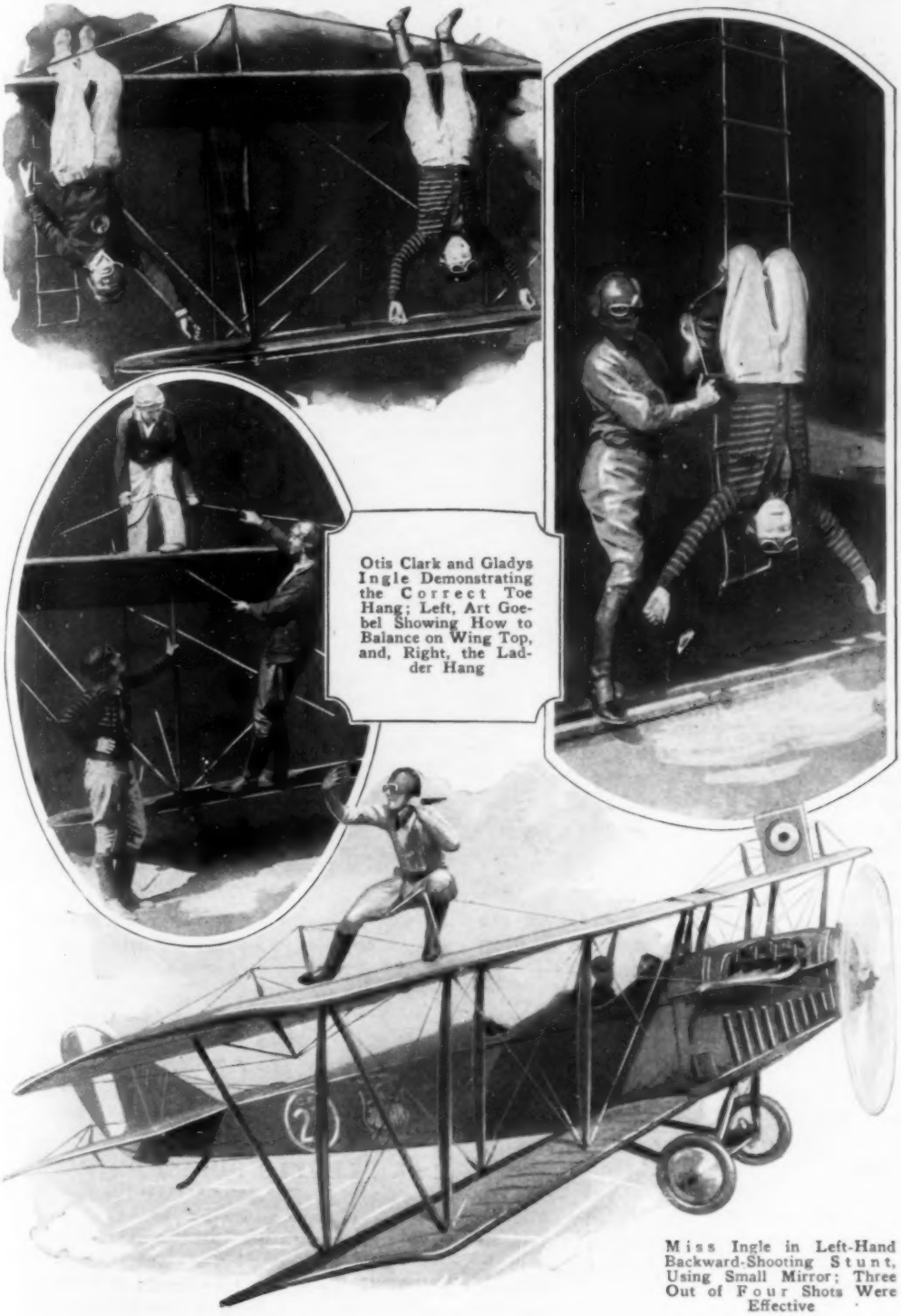
PUMP-LIKE CHURN MAKES BUTTER QUICKLY

One of the most recent modifications of the churn is a Parisian apparatus consisting of double-stroke pistons turned by a crank, a suction tube into which the cream is drawn and another outlet at the other side with an air valve. As the cream comes through and is mixed with air, the butter is rapidly formed and delivered in small chunks through the tube on the front of the churn. The apparatus can handle from 100 to 150 quarts daily and may be operated with a motor.



Pump Churn in Action; Butter Delivered at Right

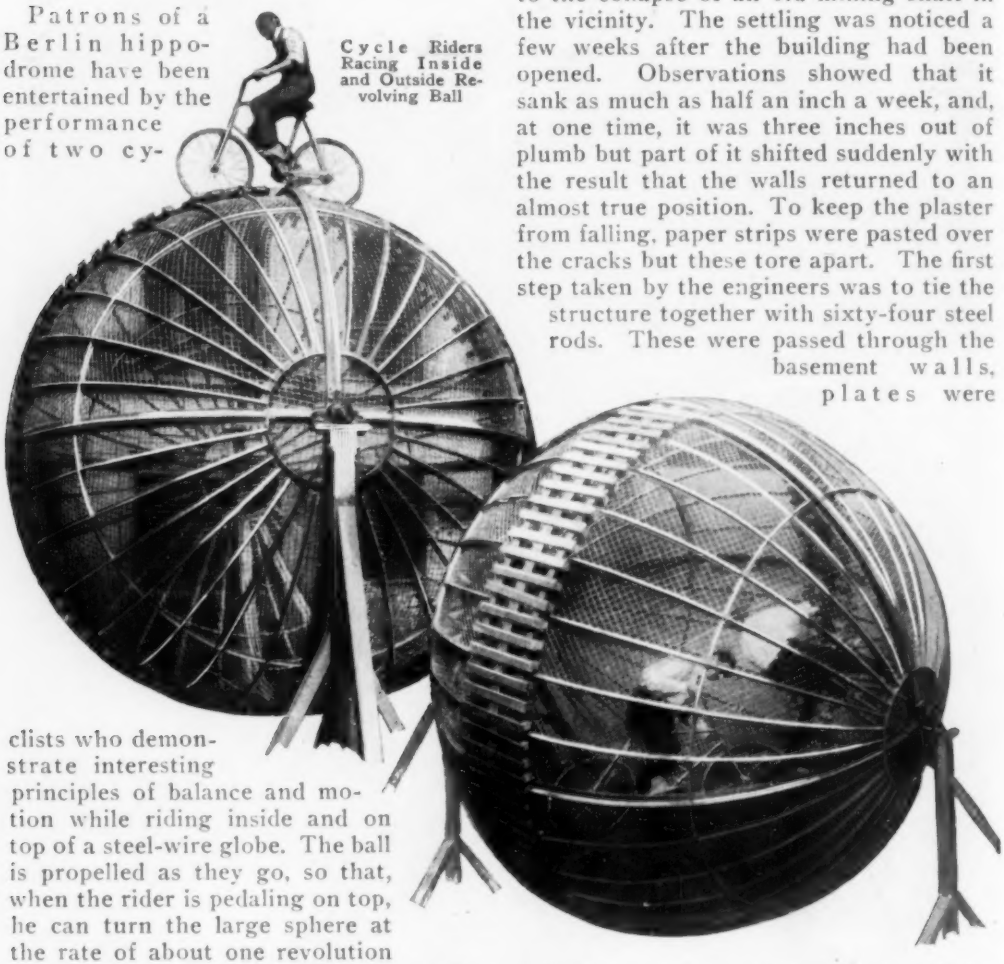
HOW STUNT FLYING IS TAUGHT IN UNIQUE SCHOOL



Otis Clark and Gladys Ingle Demonstrating the Correct Toe Hang; Left, Art Goebel Showing How to Balance on Wing Top, and, Right, the Ladder Hang

Miss Ingle in Left-Hand Backward-Shooting Stunt, Using Small Mirror; Three Out of Four Shots Were Effective

CYCLISTS RIDE ON THE TOP AND INSIDE OF BALL



Cycle Riders Racing Inside and Outside Revolving Ball

Patrons of a Berlin hippodrome have been entertained by the performance of two cyclists who demonstrate interesting principles of balance and motion while riding inside and on top of a steel-wire globe. The ball is propelled as they go, so that, when the rider is pedaling on top, he can turn the large sphere at the rate of about one revolution per second. A cleated roadway, on the outer surface of the ball, affords traction for the wheels of the bicycle.

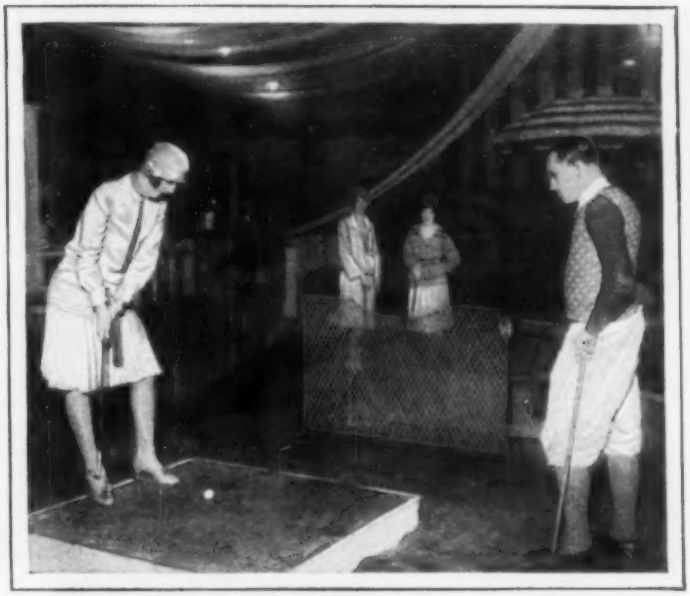
SINKING BUILDING TESTS SKILL OF ENGINEERS

Engineers are waging an interesting battle at Edwardsville, Ill., to prevent the destruction of a new hospital building by sinking. The cause of the movement is unknown. The structure weighs more than 2,500 tons and already has sunk to various depths, ranging from three to twelve inches, supposedly through a fault in the earth. Great fissures, at places a foot wide, have opened in the surface of the ground close to the building. An attempt is being made to trace the action to the collapse of an old mining shaft in the vicinity. The settling was noticed a few weeks after the building had been opened. Observations showed that it sank as much as half an inch a week, and, at one time, it was three inches out of plumb but part of it shifted suddenly with the result that the walls returned to an almost true position. To keep the plaster from falling, paper strips were pasted over the cracks but these tore apart. The first step taken by the engineers was to tie the structure together with sixty-four steel rods. These were passed through the basement walls, plates were adjusted on the outside and the building drawn together to some extent by means of turnbuckles on the rods. The next move was to place jacks around the supports in the basement, in the walls and at other points to raise the building. It will be allowed to rest on the jacks until the settling appears to have subsided, when a concrete foundation will be put in.

LAKE LEVELS RULED BY RAINS SURVEY SHOWS

Diminished rainfall in the watershed of the Great Lakes is chiefly responsible for the lowering of the lake levels and not diversion through the Chicago drainage

canal and other channels, according to records of government engineers. Their survey shows that Lake Superior, although not influenced by diversion elsewhere, reached a lower stage last year than at any other time of official record. The levels of lakes Michigan and Huron fluctuate almost as one body of water. They have been dropping ever since 1918. From about 1860, the level of Lake Michigan has undergone periodical changes, the charts indicate. One low mark was reached in 1872. A year of comparatively greater rainfall followed and the lake rose, reaching an unusually high stage in midsummer. After falling again for a few years, it reached another high level in 1886. Since then lower and higher stages have alternated up to the present time.



Teeing Off for the First Hole on the Indoor Course; the Play Affords Excellent Practice for the Outdoor Shots

COAL AS SUBSTITUTE FOR STONE USED IN BUNGALOW

Walls of a bungalow erected by the chamber of commerce in Middleboro, Ky., are of bituminous coal, the chief product of the region, laid in mortar. No preservative or other protective finish was applied to the outer surface of the walls, for the coal is expected to resist the weather for an indefinite period.

Kentucky House with Walls Made of Lumps of Coal; a Pleasing Contrast Was Gained with White Mortar

GOLF COURSE IN AN ARMORY HAS EIGHTEEN HOLES

Golfers can enjoy many of the thrills of the regulation game in an eighteen-hole course arranged in a New York armory. Bunkers, traps and other features of the outdoor links are duplicated by carefully adjusted barriers, and there are said to be many opportunities for skillful shots.

FIRELESS STEAM ENGINE HAULS STREET CARS IN JAVA

Street cars in the city of Batavia, Java, are pulled by a locomotive run by steam from a storage drum, which is filled to a pressure of 600 pounds when the engine leaves the barns. This is usually sufficient to make the run, as the intense heat of the sun helps reduce losses. When it rains and the drum is cooled, an extra locomotive is sometimes needed to tow the other one in for another filling. The fireless and smokeless feature of the locomotive commends it for usage on city streets.

¶Gorillas sometimes attain an age of thirty or forty years.

Huge Log Hollowed Out and Mounted on Trailer for Auto Trips; Three Men Worked a Month Cutting Interior of Section

HOLLOW LOG ON AUTO TRAILER SERVES AS TOURIST'S HOME

To provide living quarters while on automobile trips, a western man fashioned a traveling bungalow from a huge log which was hollowed out to make room for folding beds, kitchen equipment and other features. The trunk measured nine feet four inches in diameter and, judging from the rings, was over 400 years old.

UNDERGROUND QUAKE MILDER THAN ONE ON SURFACE

Earthquakes are felt more on the surface than below it, because the motion often resembles a wave. Below the surface of water, there is comparatively little action; at the top, the deep furrows and crests of the waves are in active motion and a ship rolls among them, the effect being even more noticeable to persons in the crow's nest. In the case of the earthquake, the axis of the swings seems to be at the surface. The damage done to high buildings frequently shows that the jerk is far greater at a certain distance from the surface at which it apparently originates. In the Montana quake, in 1925, it was recorded that telegraph poles and automobiles leaned one way and then the other, describing arcs of as much as thirty degrees. Chimneys were twisted about without being destroyed. The quake in Tokyo, Japan, produced similar effects. Monuments were turned about on their pedestals and, in some of the larger buildings, all the windows on one story were broken while no damage was done to those above or below, indicating that the structure had "bent" at a certain point as it swayed with the wavelike movement of the earth.

COIN OF FIRST ROMAN REPUBLIC WEIGHS HALF POUND

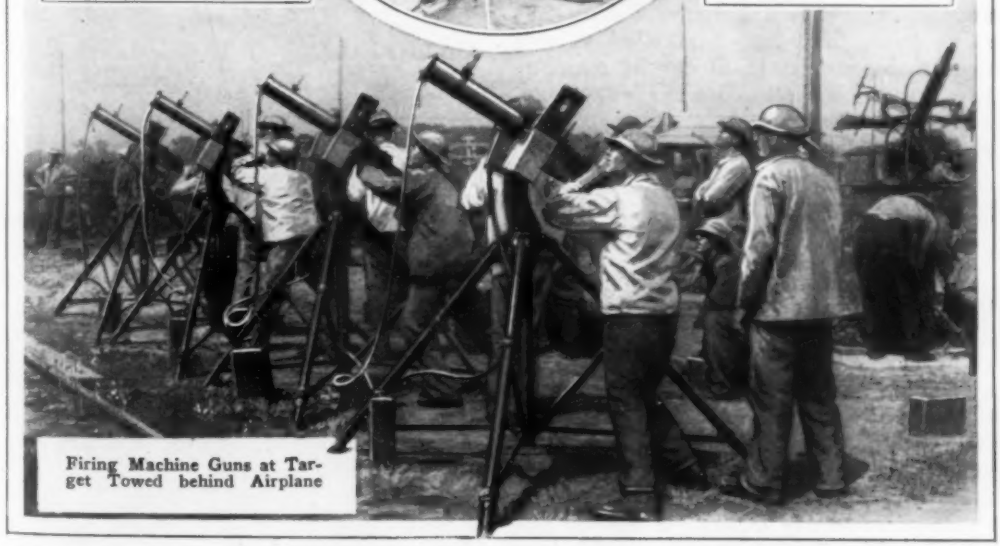
About eight inches in circumference, a coin which was in circulation as long ago as the days of the first Roman republic has been found in the suburbs of Rome and is now in the possession of a New York jeweler. It is of metal closely resembling gold and, despite the wear of time, the figures on each side have not been obliterated beyond tracing.

Old Roman Coin, Showing Figures in Bas-Relief Partly Obliterated by Age

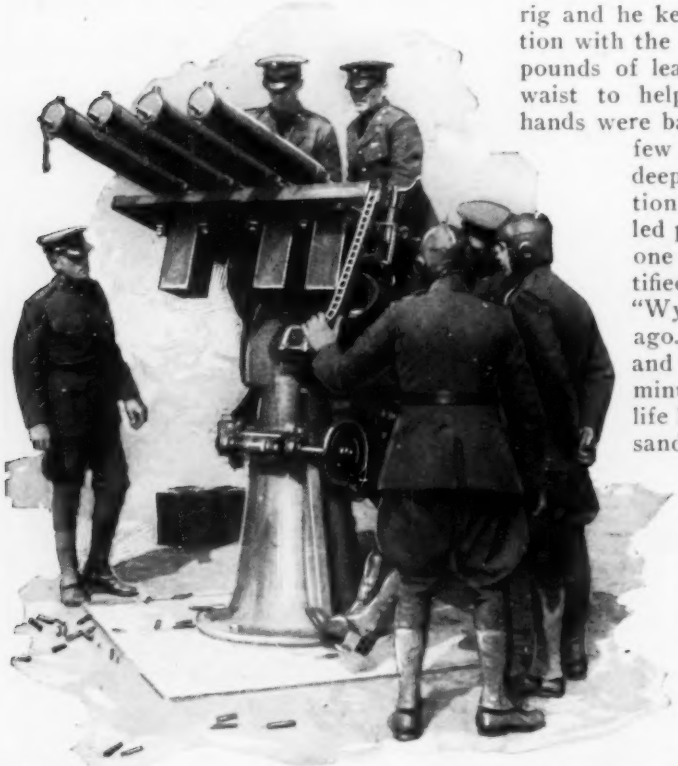
HOW ARMY IS PITTING ITS GUNS AGAINST PLANES

Above, Four Three-Inch Antiaircraft Guns in Action at Aberdeen Proving Grounds

Examining Finder Which Quickly and Accurately Tells Range of Moving Airplanes



Firing Machine Guns at Target Towed behind Airplane



For Defense against Aircraft; the Four-In-One Gun Recently Tested at the Aberdeen Proving Grounds

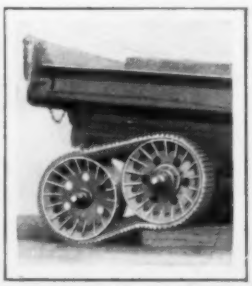
FOUR GUNS ON SINGLE MOUNT TO COMBAT AIRCRAFT

One of the latest weapons devised to oppose aircraft is a battery of four machine guns, fired and controlled as one from a single mount. It can be manipulated for quick aiming and has long range. The gun was tested by army men recently at the Aberdeen proving grounds.

SIX-MILE WALK ON SEA BOTTOM LATEST HIKING RECORD

Walking on the ocean bottom across Hampton Roads to the naval base in two hours and fifty minutes, Klass Everts, a deep-sea diver, established a record in submarine hiking. He entered the water at eleven o'clock and emerged at 1:50, but little fatigued and complaining only that he had broken the lace of one of his iron shoes and that he had been deprived of his usual noon-day cigars. A launch accompanied him with air pump and life-line rig and he kept in constant communication with the crew by telephone. Eighty pounds of lead were strapped about his waist to help weight him down. His hands were bare, an unusual feature, for few divers care to explore the deep without adequate protection for their hands. The walk led past the wrecks of old ships, one of which he partially identified as that of the steamer "Wyanoke," sunk several years ago. Anchors were also seen and one delayed him for several minutes while he untangled his life line. "I am now walking in sand," he called through the phone. The next, he reported that he was up to his waist in mud. Hundreds of fish, large and small, were encountered. Some stopped to gaze at the intruder and then darted away as if they were shot out of guns. Near the naval base, Everts reported that he was walking on rocks, the first time such a formation was found at the bottom of Hampton Roads. Once he stepped into a deep channel and had difficulty in climbing up the steep sides. The distance covered was about six miles.

CATERPILLAR REAR-DRIVE CAR RUNS AT HIGH SPEED



Speed of thirty-five miles an hour is claimed for an auto truck with a four-wheeled caterpillar drive at the rear. It is designed to combine the advantages of a fast carrier and one that will give maximum traction without injuring the surface of the road. A four-cylinder motor delivers seventy-two horsepower.

¶Some spiderwebs are so strong that birds are captured in them.

ROLLER-BEARING RAILWAY CARS TO ELIMINATE JERKS

More than 100 cars on a western railroad are being equipped with roller bearings for smoother riding and to permit operation of longer trains. Tests have shown that a twenty-one-car roller-bearing train could be started much more easily than a twelve-car standard train. Experiments with individual cars proved that the roller-bearing type required only a fraction of the tractive effort needed to start an ordinary coach. Engineers believe that these bearings will remove what is known as "the hump in the road"—the tremendous power necessary to overcome the inertia of a standing train, and that passengers will be spared the shaking up that frequently attends a rough start.

LAMP FOR TELLING FORGERIES SHOWS DIFFERENCE IN INKS

Telltale marks, too faint to be detected by the unaided eye, are said to be revealed plainly under a powerful lamp devised for exposing forgeries in checks and other documents. Much of its effectiveness lies in the fact that, if two different kinds of ink have been used in the writing, the discrepancy in colors and quality is shown.

To Expose the Tricks of the Forger; Powerful Lamp Which Detects Differences in Inks

Pitch Pipe with Sliding Mouthpiece Can Be Used on Several Different Instruments

PITCH PIPE LIKE HARMONICA PRODUCES SEVERAL TONES

Tonal accuracy said to be impossible in ordinary instruments is afforded in a pitch pipe somewhat like a harmonica. On one side are indicated the tones and positions of the notes of the treble staff, and a sliding mouthpiece enables the user to select the one desired. The pipe is designed especially for vocalists and players of stringed instruments.

PETROLEUM MADE BY CHEMIST YIELDS GASOLINE

Petroleum has been produced synthetically in the laboratory of a French chemist, according to reports. The product can be refined like the natural substance to yield gasoline, kerosene, various oils and other by-products, it is said. The process includes the use of secret agents. An initial step is to submit a mixture of hydrogen and oxygen to great pressure and filter the resulting product with an agent that causes a transforming reaction.

Hand-Dart Throwing, a Modification of Archery for Indoor or Outdoor Amusement; the Target Tells Value of Shots

THROWING DARTS AT TARGET DEVELOPS STEADY HAND

Bowless archery has been added to the list of skill-developing games for indoor or outdoor amusement. It is played with a target and three small darts for each contestant. They have feathered guides and a sharp tip and are hurled at a distance of ten feet toward the target which is made of soft material. Scoring twenty points wins the game.

RECORDS FOR LONG LIFE HELD BY POPES AND PRESIDENTS

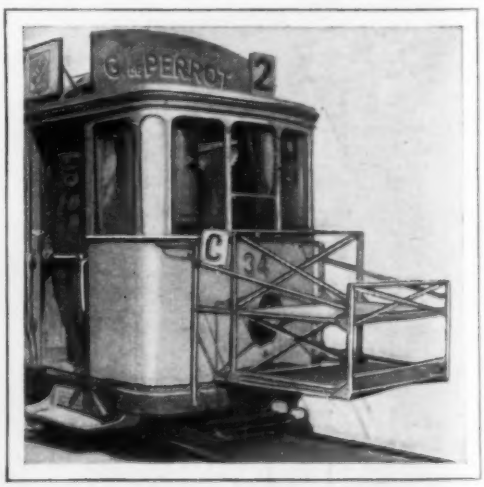
According to the findings of a Russian economist, the presidents of the United States have averaged the longest life spans, their record being 69.9 years. Popes of the Roman Catholic church follow closely with an average of 69.6 years, and American millionaires are third with a record of 69.2. Scholars and scientists average 67.3 and writing men 64.4. The poorest showing was made by the hereditary monarchs of Europe with an average of but 53.6. While there are individual cases of long lives, the generally low record is believed to be due to the prevalence of intermarriage among the royal families. The showing made by the presidents and the popes is explained by the fact that both are elective offices, and men of mature years and good health are chosen for them. They usually have made their own records and have not been hampered by the accident of birth from poor stock.

MANY CHANGES IN JUPITER

Within the last few months, remarkable changes have been observed on Jupiter. The phenomena are similar to those which occurred in 1919. The planet's south tropical belt had almost disappeared by last October, the telescope revealed, being replaced by a brighter and broader zone. The "great red spot," which had faded, showed considerable color again, becoming pink instead of a neutral gray.

BAGGAGE RACK ON STREET CAR REDUCES CROWDING

Quantities of luggage carried by tourists in Lausanne, Switzerland, have perplexed street-car officials. By attaching



For Transporting the Passengers' Luggage; Rack on Rear of Swiss Street Car

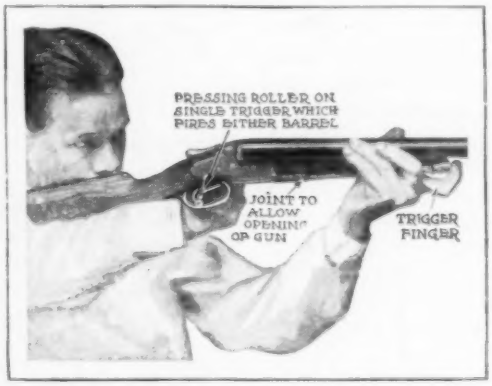
a roomy rack on the outside for bags and bundles, more space is provided for passengers within, and there is less trouble in leaving or boarding the car.

RULES FOR FIGHTING MOSQUITO

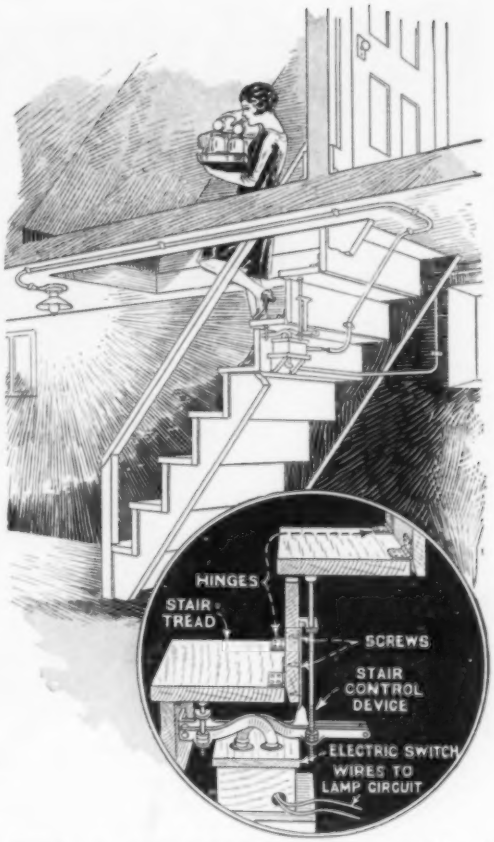
Early in the season is the time to begin campaigns against mosquitoes, according to Maj. Edwin M. Skinner, of the Gorgas Memorial institute, and by following a few simple rules, citizens can do much to reduce the pests before they are on the wing, he asserts. Six preventive measures were cited as effective ways to combat the insects. First, take care that roof gutters are not sagged or choked. Cover cisterns tightly, so that the mosquito cannot deposit its eggs on the water. In this connection, the overflow and other openings should be protected with a fine-mesh screen. Tin cans or other containers likely to accumulate water should not be allowed on the premises. The basement should be kept free from water. Cellar screens should be left on until late in the fall so that the insects cannot get into the basements and hibernate, and, finally, tall grass and weeds should be cut down.

SHOTGUN FOR ONE-HANDED MAN IS FIRED BY SPRING ROD

Being crippled seems to increase the desire of some men for firearms, and many have overcome their misfortune to such a degree that they have shown considerable skill with ordinary guns. A special double-barreled shotgun built to the order of one crippled shooter is unique in the way it is fired. Besides the usual trigger, there is a sliding rod held in a forward position by a spring. It is actuated by pressing the end which is exposed under the forestock. This moves the trigger, firing the first barrel. Releasing the rod engages the trigger with the second-barrel mechanism for the next shot. The advantage of this arrangement is that the user's good hand is well forward to permit better control of the gun especially in rapid swings on clay birds or swiftly moving game.



How Crippled Marksman Handles His Shotgun; Spring-Trigger Rigging Permits Easy Firing



Drawing of Light Switch, Installed under Stairs, and Inset Explaining Details

LIGHT CONTROLLED BY STAIRS ACTS AS BURGLAR ALARM

A tread on the stairs presses a switch and turns on the electric lights by a recently introduced system to help illuminate the cellar and to eliminate the waste of current that occurs when the light is left burning by forgetting to press the button. The circuit is broken when the weight on the step is lifted. The installation can be rigged to serve as a signal, warning of the approach of an intruder. It is said to be easily put up and presents no fire hazard

Weather Made While You

By PAUL D.

Shaking Dust and Soot from an Air Filter; Hundreds of Pounds Are Collected Yearly from a Single Large Building

HOMES, offices and factories will soon be cooled in summer just as they are now heated in winter, according to Prof. E. F. Miller, of the Massachusetts Institute of technology. "Shut the windows, turn on the electricity and keep cool," will be the rule during the scorching summer months.

"The increasing demands upon human energy in this age of swift progress and keen competition call for new measures for physical comfort and protection," says Prof. Miller. "Extreme summer heat slows human activity and lowers efficiency in all branches of endeavor, whether it be in factory, office building or home.

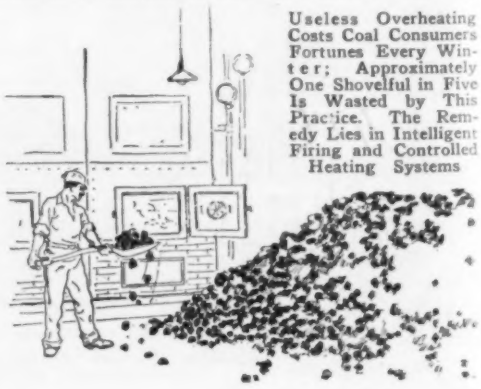
"The household furnace has overcome the cold of winter, but humanity still suffers from the summer heat. It seems likely that, within a few years, cool rooms in which to work and live will be considered just as much a necessity as warm homes and buildings are in winter.

"It is not a serious problem now to produce air-conditioning and cooling plants for domestic purposes. These will consist of a refrigeration system in which air will be cooled and the moisture removed before it is put into circulation.

"The home-cooling and air-conditioning plant of the future will function with no more attention than the electric refrigerator. It also will be operated by electricity and will be equipped with thermostatic control, to maintain an even, comfortable temperature regardless of the heat outdoors."

Artificial weather is now a vital factor in more than a hundred kinds of business. It definitely started about twenty-five years ago in a printshop in Brooklyn, N. Y. A big color contract had been accepted. The day was hot and humid. The ink wouldn't dry. To complete the job on time and with profit, the proprietors sought a way to control air conditions in the shop regardless of weather variations outside.

Today, weather is made to order for motion-picture studios, public buildings of all kinds, hotels, bakeries, candy shops, potteries, cigar and cigaret factories, chemical laboratories and scores of other



Useless Overheating Costs Coal Consumers Fortunes Every Winter; Approximately One Shovelful in Five Is Wasted by This Practice. The Remedy Lies in Intelligent Firing and Controlled Heating Systems

to Order Wait

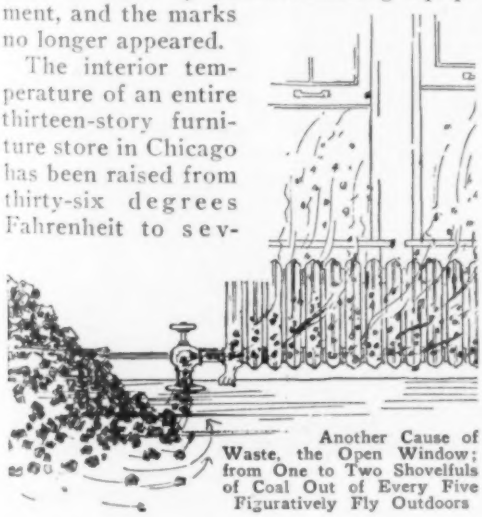
PADDOCK

institutions. Almost every article we use has felt the touch of modified weather. It formerly took months to dry the many coats of paint on automobiles. Now, it can be done in a matter of hours, due partly to improved finishes and to efficient temperature controls and circulation.

A razor-blade manufacturer found that the rapidly moving grinding machines affected the air in such a way that moisture collected on the steel, rusting the product. He ordered apparatus that reduced the humidity in the plant and had no more trouble. A maker of metal pencils was bothered by unsightly marks found on nearly every holder after wrapping because the girls' fingers perspired. Air conditions in the room were modified by weather-making equipment, and the marks no longer appeared.

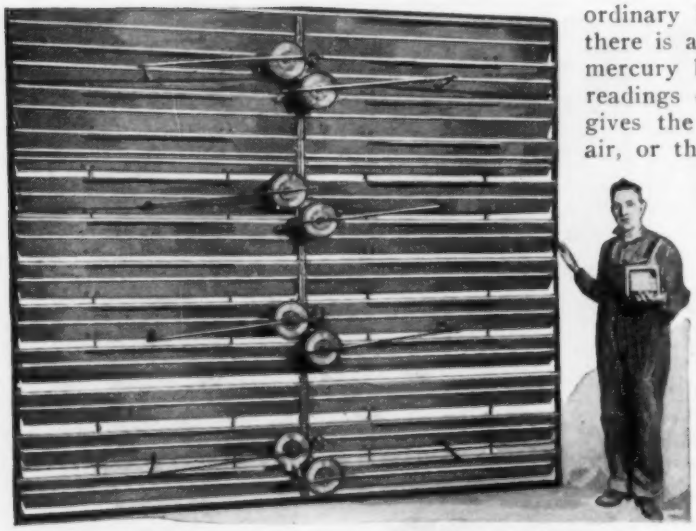
The interior temperature of an entire thirteen-story furniture store in Chicago has been raised from thirty-six degrees Fahrenheit to seventy degrees in thirty-five minutes by its efficient heating and ventilating system. A 4,000-seat motion-picture theater adds a luxury by cooling its air. By pressing a button, the entire auditorium can be pleasantly filled with a perfume in keeping with the picture on the screen, such as the fragrance of roses or lilies for a garden scene, and other appropriate odors. Apparatus supplied by a leading equipment manufacturer is furnishing 500,000,000 pounds of "conditioned" air every working day, enough for 20,000,000 persons to breathe.

Manipulating Temperature and Ventilating Controls in London Town-Council Room; Each Member Can Adjust "Weather" to Suit Himself



Another Cause of Waste, the Open Window; from One to Two Shovelfuls of Coal Out of Every Five Figuratively Fly Outdoors

The benefits of correct weather also are being enjoyed in homes. Dr. Willis L. Moore, former chief of the weather bureau, has not opened a window in his California house for two years. An efficient ventilating and cooling system has made it unnecessary. Engineers say that it is only a question of time when the majority of persons can enjoy better weather at home. Two factors promise realiza-

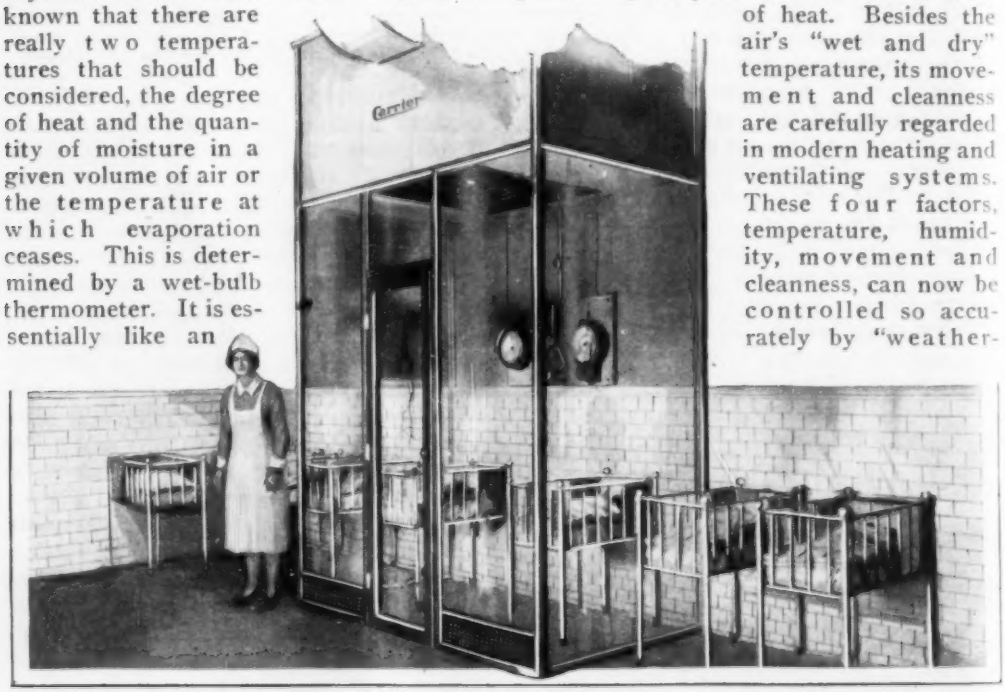


One of the Marvel Units of a Modern Heating and Ventilating System, a Set of Dampers, Controlled by Rheostats, to Regulate Air Conditions

tion of this dream—abundant electricity and well-insulated houses.

Only a few years ago, most persons thought of weather largely in terms of temperature, and they read the temperature from but one instrument, a common dry-bulb thermometer. But it is now known that there are really two temperatures that should be considered, the degree of heat and the quantity of moisture in a given volume of air or the temperature at which evaporation ceases. This is determined by a wet-bulb thermometer. It is essentially like an ordinary instrument except that there is a moistened wick over the mercury bulb. Comparison of the readings on the two thermometers gives the relative humidity of the air, or the relation of moisture to the temperature. This factor is now considered vastly important to health and comfort.

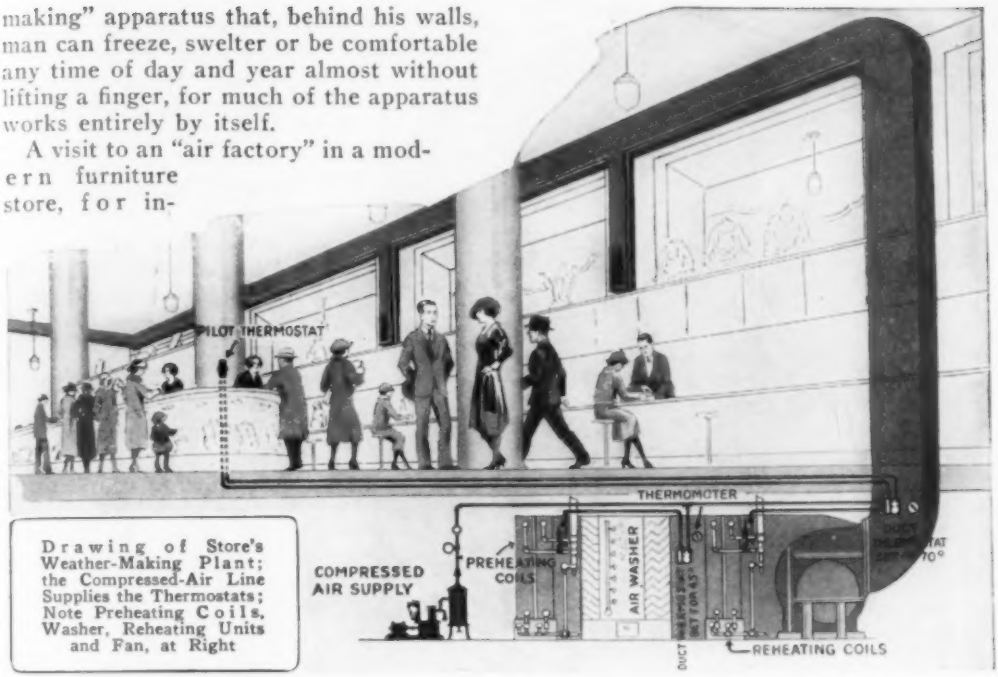
Moist air reduces the amount of evaporation from the skin, and evaporation takes heat from the body and from the air, so that a cooling effect is produced. Hence, if the air is too dry on a cold winter day, the inside of the house may feel uncomfortable even at a high temperature, because evaporation is in progress. Moistening the air permits lower temperatures for comfort, saving fuel and guarding health. In the same way, a hot moist day in summer is oppressive because of the blanket of wetness about the body, preventing evaporation and the removal of heat. Besides the air's "wet and dry" temperature, its movement and cleanness are carefully regarded in modern heating and ventilating systems. These four factors, temperature, humidity, movement and cleanness, can now be controlled so accurately by "weather-



Where Weather Is Made to the Order of Exacting Physicians; a Glimpse in a Hospital's Baby-Incubator Room; Part of Control and Registering Apparatus on Wall

making" apparatus that, behind his walls, man can freeze, swelter or be comfortable any time of day and year almost without lifting a finger, for much of the apparatus works entirely by itself.

A visit to an "air factory" in a modern furniture store, for instance, leads to a curious room close to the roof where air is drawn through an opening in the outer wall, at the rate of several thousand cubic feet per minute, by a powerful fan turned by a twenty-five-horsepower motor. This wind is sucked through a rack of filters inclosed in a steel cabinet. On the air side, these screens are fuzzy with soot and dirt that has been trapped by the mesh and oil on the filters. A ton and a half of dirt that otherwise would have lodged in the noses and throats of customers, and on furniture, is collected every year from the 120 filters in this building. The screens are constantly being cleaned and bathed in an odorless oil. This absence of aroma is essential, as otherwise the building would be filled with an unpleasant smell.



Drawing of Store's Weather-Making Plant; the Compressed-Air Line Supplies the Thermostats; Note Preheating Coils, Washer, Reheating Units and Fan, at Right

Rid of much of its foreign matter, the air next gets a bath in a big spray tank, before it is sucked into the ducts that lead to all parts of the building. This cleans it further and also contributes moisture. Arrangements are provided for heating the air with steam before it strikes the wash water in winter and for reheating it afterward or removing excessive moisture. After the air has passed through the rooms, it is drawn out again by another huge fan so that circulation is maintained. In some installations, a refrigerating unit is included. This consists of an assembly of ice-making machinery and cooling coils over which the air is passed to lower its temperature. Some of the refrigerating plants in large motion-picture theaters would freeze 300 tons of ice every twenty-four hours if applied for that purpose. No actual ice is made in the air-cooling process, however.

The whole system is often so well adjusted that thermostats can be set at a certain temperature and will keep an entire building at approximately that point throughout the year. In winter, heat is automatically turned on in case the interior gets too cold. In summer, the temperature can be largely governed by regulating the amount of moisture in the air.

These thermostats, the silent sentinels of the system, are what make operation with such efficiency and with so little human supervision possible. There are many types of the instruments, but, in general, they function by expansion and contraction caused by temperature changes, to actuate compressed-air or clockwork mechanisms that open or close valves directly controlling the heat.

Removing a Screen inside a Filter Room; the Fuzzy Surface of the Other Screens Shows How Air Coming In at Right Is Being Cleaned

For instance, the temperature of the spray water in the air washer gets too cold. A unit in the controlling thermostat contracts. Compressed air, carried at about fifteen pounds' pressure, causes a valve to open, admitting steam to the spray-water heater. When the temperature reaches a certain point, the thermostat unit expands, the steam valve closes, and the heat is shut off. These vigilant regulators effect savings of thousands of tons of fuel annually, insure accurate and constant air conditions; in short, make it possible for the engineer to deliver the kind of weather wanted at any time. In some buildings, another marvelous instrument has been installed to aid in temperature control. It is an electrical apparatus which makes it possible for the engineer to remain in his office and yet determine the temperature in any room or section of the building simply by pressing a button. The instrument translates electrical resistance at different temperatures into degrees. Pressing the button completes the recording circuit to that room, and the reading is shown on a dial above.

What is the proper temperature for indoor comfort and efficiency? There are many answers to this question, but tests have shown that satisfactory results are attained in offices that are kept at sixty-eight to seventy degrees Fahrenheit and in shops that are between sixty-five and sixty-eight degrees with the relative humidity at fifty. Considerably lower temperatures are needed where much physical effort is involved.

Raising the temperature two degrees reduced efficiency fifteen per cent in one shop, although the men were stimulated to do their best by a cash bonus. In a shell factory, accidents were sixteen per cent more numerous with the temperature at fifty degrees Fahrenheit than at sixty-seven degrees and thirty-two per cent more numerous at forty-seven degrees. Numb fingers were largely responsible. Too much heat seemed to cause carelessness and inattention, for at seventy-seven degrees Fahrenheit there were twenty-three per cent more accidents than at sixty-seven degrees.

Lack of proper humidity in offices and homes is one of the big causes of colds in winter. A large insurance company, employing 6,700 persons, lost 62,233 days of work in one year because 2,824 cases of colds enforced absences. Dry air cracks the delicate lining of nose and throat, exposing the areas to injurious dirt and disease germs.

Hence, it is essential to supply moisture in heated rooms because air doubles its capacity for holding moisture for every eighteen degrees that it is heated. A hot fire will soon make the air too dry for health and comfort unless moisture is supplied. Humidifying apparatus is recommended by engineers, and they also advise using both a dry and wet-bulb thermometer for greater accuracy and safety in regulating the weather made to order for home, office or workshop.

SOFT WOOD OF PALMETTO TREE USED FOR FURNITURE

Impetus to the furniture and woodworking industry is forecast from the recent discovery of a method of utilizing the soft, pulpy wood of the sable palmetto tree, which grows in abundance along the southern coast. By a process developed at the Georgia school of technology, it is now possible to harden the fine-grained pulp and to effect a finish as smooth and glossy as that of the bird's-eye maple. The method is the result of two years' research and the work was made difficult because of the spongy quality of the wood, a good description of which is given in the story of the defense of Fort Moultrie, where the shots of the British fleet sank harmlessly in the soft logs. The wood, until now, has been useful for little else than dock piling. In preparing it for veneering, the section of the log is placed on a veneer lathe and unrolled in sheets, one tenth of an inch in thickness. These sheets are then subjected to a secret chemical process to harden the pulp, which is held together by the tough fibers. After being smoothed down, the veneer is applied in any finish desired. Samples have been prepared in walnut, mahogany, golden oak and green.

FOLDING HOLDER FOR CYMBALS AMPLIFIES TONES

Improved orchestral effect is the result claimed for a cymbal holder that is fitted to the rim of the drum and may be folded into a compact unit for the kit. It prevents the cymbals from swaying unduly when struck and has a metal cup which amplifies the tones. Pieces of felt attached to the cup help control the vibrations of the cymbals without destroying the natural quality of their clashing sound.

Amplifying Cup Visible on Top of Cymbal, Which Is Clamped to Drum So That It Cannot Sway

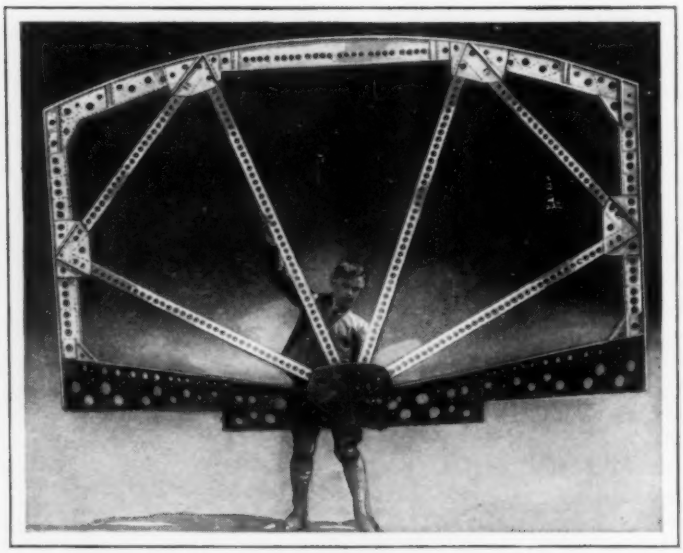
Attending an Accident Victim from Roadside First-Aid Station; Key to Cabinet Is Returned by Mail

ROADSIDE FIRST-AID STATION SERVES FOR ACCIDENTS

Bandages, dressings and other useful articles are kept in a cabinet by the side of an English highway for use in accident emergencies. Breaking a glass panel exposes the key which unlocks the box. The key is then dropped into a letter box and returned to an ambulance station.

TWENTY-SEVEN YEARS USEFUL LIFE OF SKYSCRAPER

Modern steel buildings will last several decades, but their period of usefulness is placed at only twenty-seven years by a New York authority. He declares that most of the structures of this kind are built not for perpetuity, as in ancient days, but with a view to replacement when their estimated usefulness is over.



Demonstrating Light Weight of Metal Being Used for Huge Airplane; Whole Span Easily Lifted by One Man

LIGHT METAL FOR AIRPLANE TO AID LONG FLIGHTS

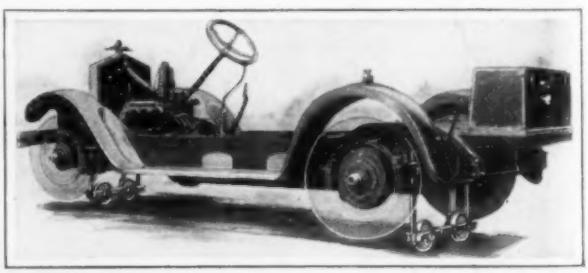
Since travel by air is largely a battle against gravity, experts are looking more and more to lighter and stronger materials to make possible longer and less expensive flights. Progress in this direction is illustrated in the metal that is being used to build a huge airplane in Germany for sea voyages. It is so light that one man can easily lift a fabricated span more than eleven feet wide. The plane is to have convenient and luxurious quarters for passengers.

MAN-EATING CROCODILES CAUGHT WITH STICK

Protected by the dense mangrove swamps near the ocean, the crocodiles of Borneo have flourished until the island has become known as the refuge of the largest and most ferocious creatures of this kind in the world. Some specimens that have been captured measure thirty-three feet in length. They lie almost submerged in quiet places along the rivers waiting for their prey and present a menace to unwary swimmers. Their jaws grow to be four feet long and they can deal a deadly blow with their tails. In catching the crocodiles, natives attach a piece of meat to a short stick sharpened on both ends. This is fastened to a strong fibery leader, ten or twelve feet long, and the leader tied to a piece of rattan, forty or fifty feet in length. The bait is suspended over a stream and when swallowed, the sharp stick lodges firmly in the crocodile's stomach. The animal is located by the piece of rattan floating on the water. Armed only with spears, the natives tug at the rattan. An advantage of the fibery leader is that it slips between the crocodile's teeth and is not often bitten through. The beasts have but one friend, a small bird that devours insects on their bodies, even picking morsels of food from between their teeth while they lie sleeping.

SIDEWISE DRIVE FOR AUTOS SIMPLIFIES PARKING

So that automobiles may be parked and removed with a minimum of effort in narrow spaces, an eastern inventor has devised auxiliary wheels that permit the car to run sidewise. Without leaving his seat, the driver shifts levers to actuate a worm gear which causes an extra set of wheels to be forced downward raising the car, and another shift rolls it to or from the curb. When the auto is back in running position, the auxiliary wheels are drawn



How the Auxiliary Wheels Are Lowered to Run the Car Sideways for Parking

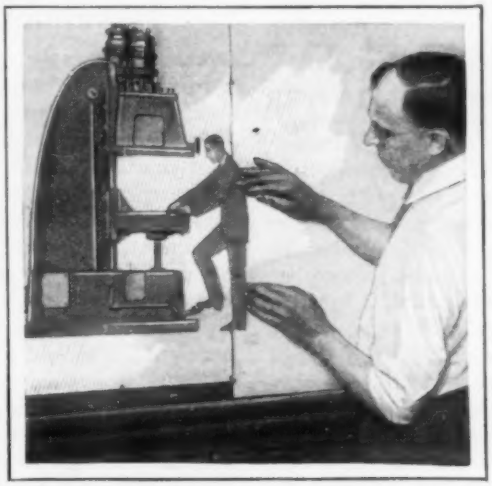
up out of the way. With this arrangement, an owner could build his garage in a narrow alley and drive the car in sideways while the lift feature serves the same purpose as jacks in raising it for repairs.

HOT AIR USED TO PAINT PICTURES BY RADIO

An improvement in the transmission of pictures by radio has been developed to eliminate the "freckled" appearance of the received picture from the dots and dashes drawn by the fountain pen of the recording apparatus. Instead of the pen, which had a habit of clogging up with dried ink whenever it remained idle a short time, the new recorder is a tiny jet of hot air, projected against a sheet of specially sensitized paper. The hot air develops the chemicals in the paper, and the attendant sees the picture gradually appear before him. A nozzle with an aperture only five-thousandths of an inch in diameter releases the air, which is controlled by a photoelectric cell. As the incoming current fluctuates, the air stream increases or decreases, causing a corresponding tone change in the picture.

CARDBOARD DOLLS PLAY PART IN DESIGNING MACHINE

A jointed cardboard manikin, carefully fashioned to correct scale, is used in a Chicago electrical works with drawings of machines so that the draftsmen can tell if they have allowed enough room for an operator, and if the equipment will be easily manipulated in different positions. The dummy is moved about into various postures in order to duplicate the working conditions as nearly as possible. Joints of the body are accurately located, allowing the figure to be bent forward and backward correctly.



Cardboard Figure Can Be Moved to Represent Worker in Action at Machine

The Pay-As-You-Enter Bus Appears in New York, Simplifying the Conductor's Task

PAY-AS-YOU-ENTER AUTO BUS TO REDUCE ACCIDENTS

So that the bus conductor can remain on the rear platform where he will always be in a position to help passengers on and off and thus reduce accidents, the motor coaches in New York city have been testing the pay-as-you-enter plan with good results. The scheme is said to have proved satisfactory especially in congested districts, where patrons are tempted to enter or leave the bus while it is moving slowly. It was found that little extra delay was caused at the loading stations. The fare box is in one corner of the entrance platform where it does not obstruct the door.

¶ Only about 30,000,000 of the world's available 450,000,000 horsepower from water is used.

Courtesy General Electric Co.

Silver-Tipped Skyscraper as It Appears at Night, Its Crest Flooded by Electric Lights

LIGHTS ON TOP OF TALL TOWER EMPHASIZE ITS HEIGHT

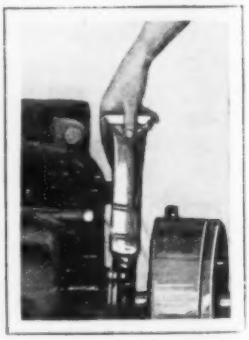
Proportions of the 475-foot Book tower in Detroit, Mich., are accentuated at night by 128 floodlights and reflectors that bathe the top of the structure in colored radiance. Some of the lamps have amber glass and others a shade of rose. Eighteen projectors and fourteen reflectors are directed to shine on the roof. The lamps are of 500 and 200 watts and produce harmonious lighting on all sides of the tower.

¶To improve the appearance of floors, artistic borders in hardwood strips have been devised.

BIRDS, BEASTS, INSECTS MAKE OWN WEATHER FORECASTS

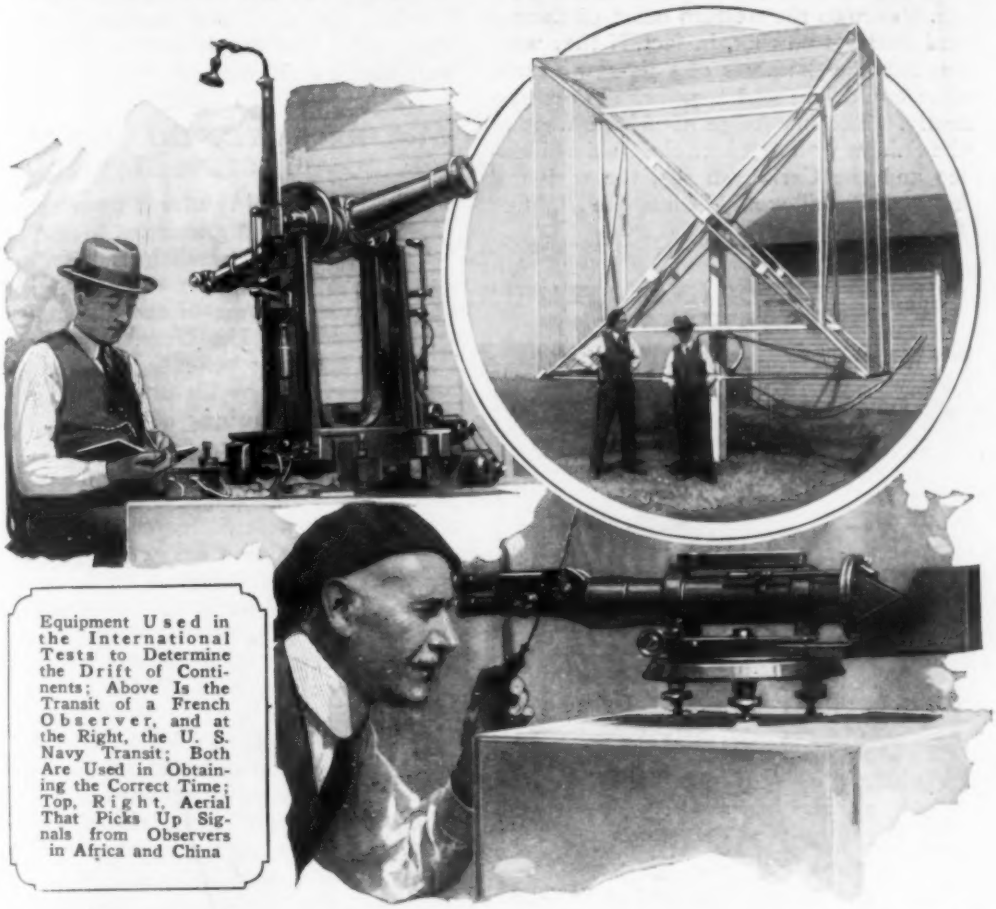
The ability of birds and animals to foretell changes in weather, a fact that has been noted for centuries, is credited to unusual responsiveness to alterations in the atmospheric pressure. The same faculty is more or less common to diseased or delicate human bodies, notably sufferers from rheumatism. At sea level, the column of air extending upward from every square foot of surface weighs about one ton, and a change of a single inch in barometric pressure means a change of about seventy pounds in the weight of this air column. That amounts to a change of nearly half a ton of air pressure against the human body of average size. Apparently animals and birds are much more susceptible to such changes than human beings, and are accustomed to accept them as warnings of weather changes to come. John Gay, the eighteenth-century opera librettist, wrote, "When swallows fleet soar high and sport in air, He told us that the welkin would be clear." In Gay's time people did not know that swallows could fly high when the barometer was high, because the atmosphere was denser, and hence able to support the birds at a greater height. As the barometer falls, forecasting stormy weather, the air density is decreasing, and so the birds fly at lower altitudes.

TUBE FOR GREASING MOTORS REDUCES WASTE



Ball-bearing motors can be lubricated with a minimum of waste and trouble, and without removing the housing cap, directly from a collapsible tube holding enough grease for a year's supply. The old grease is flushed out with kerosene and the new injected after the housing plug has been taken out, less dirt being introduced in this way. The tubes are made in four different sizes for larger and smaller motors.

ARE THE CONTINENTS DRIFTING IN A SEA OF ROCK?



Equipment Used in the International Tests to Determine the Drift of Continents; Above Is the Transit of a French Observer, and at the Right, the U. S. Navy Transit; Both Are Used in Obtaining the Correct Time; Top, Right, Aerial That Picks Up Signals from Observers in Africa and China

To determine whether the parts of the world are adrift on a sea of rock and may eventually separate and recombine to form new continental groups, scientists the world over have started a series of ten-year experiments made possible by radio. With delicate instruments, and checking all data obtained by radio signals flashed around the world to the widely scattered observatories, they expect to settle definitely the momentous question. It is believed that North America is shifting north and westward and eventually will separate from South America, rendering a Panama canal unnecessary. By comparing observations to be made ten years from now with those made this winter, the theory can be confirmed or rejected.

If the world is shifting, then the longitudinal lines on present maps are wrong and the location of cities and boundary lines incorrect. To determine whether errors exist, the observers simply check the stars at each station, determine from them the exact astronomical time at that point, and compare the results with similar checks at other points. Then, ten years from now, when the tests are repeated, if the different parts of the earth have shifted in relation to each other, the change will be apparent. The investigation is particularly important in view of the new theory evolved by Prof. John Joly, a distinguished scientist of Trinity College, Dublin, who believes that all the land above sea level once formed a single continent, and that over a period of millions of years it gradually broke up and the sections drifted apart to form separate continents. If you study a globe you can

see that the eastern coast line of North and South America bears a striking resemblance to the western coast of Europe and Africa, and that, in fact, if they were cut out like the parts of a jig-saw puzzle, they could be fitted together almost perfectly. The big bulge of Africa west of the Sahara would fit into the Gulf of Mexico and the Caribbean sea, the eastward bulge of Brazil, would fit into the Bight of Benin, and so on.

TINY MODEL OF GRAND PIANO FITS IN THE HAND

Almost Anyone Can Move This Piano, a Tiny Model Instrument Said to Be Accurate in Every Detail

One of the articles displayed on an "endless chain" of model products at the Sesquicentennial exposition was a replica of a grand piano constructed on a scale of one eighth of an inch to the foot. It is said to be accurate in every detail.

AUTO SAWED IN TWO MAKES POWER PLANT

By amputating the old auto and placing the engine upon a wheelbarrow arrangement for easy portability a practical means has been provided for driving the grain elevator, corn sheller, pumps and other units about the farm and shop. Power take-offs and caster spindles are furnished to form a trailer to operate corn pickers, plows and other machinery when the legs and handles of the barrow rig are removed. The car is cut in two at the rear of the crankcase.

Old Auto Sawed in Two and Prepared for Service as a Power Plant

LINCOLN'S EYE STRAIN IS SEEN AS AFFECTING HABITS

Abraham Lincoln suffered from unequal balance between the muscles of the eyeballs, a western physician has declared, and this affliction, the doctor believes, partly explains some of the traits of the great president. His frequently slouchy postures are now believed to have been naturally caused by his attempt to bring his eyes into positions of comfort. He often read while lying down; in fact, this the doctor said, was the most satisfactory posture for the purpose, because the muscle which pointed his eyeball upward was stronger than that which pulled it down. Standing above an audience and looking down upon it as he spoke, fatigued him and he did not find it easy to watch a theater performance from an elevated position, because of the strain on his eyes, it is now believed. One of the stories told about Lincoln is that he had a premonition of his death from seeing a double image of himself on one occasion in a mirror. This "vision" is now thought to have been a manifestation of the president's imperfect eyesight.

SECRET OF EARTH'S INTERIOR EXPLORED BY RADIO

With the aid of a combination radio and camera apparatus, a western engineer has obtained photographs of metals far underground and has been able to locate ore deposits at considerable depths below the surface. The outfit is a development of an instrument designed to aid in finding pools of oil and gas as well as water. It was first tested on a steel building in Denver, Colo. Photographs were obtained, showing the beams and girders although they were hidden

from sight. At Crater, Ariz., the largest mass of a buried meteor, some 1,400 feet below the top, was located with the apparatus, and, in a New Mexico mining district, rich metallic veins and bodies of ore were detected. Three ancient tunnels that had been abandoned and sealed up were discovered along with gold and silver deposits. The instrument registers returning radio waves sent into the earth on a film.

FLAG BRINGS WATER TO MINERS IN DESERT CAMP

Just as town and city residents hang out a card to inform the iceman a fresh supply is needed, so inhabitants of the mining camp of Quartz mountain in Nevada, have a way of ordering water. A flag bearing the chemical symbol of the liquid, "H_2O," halts the tank wagons, which are driven from the supply fourteen miles away.

City Customs in the Desert; Water Flag Displayed to Give Notice That a Fresh Supply Is Wanted

Presented to Commander Nobile by the Milan Automobile Club, a Gold Miniature "Norge" above the Globe's Top

GOLD MODEL OF AIRSHIP NORGE CELEBRATES POLAR FLIGHT

In memory of the first flight of a dirigible over the North Pole, a handsome trophy has been presented to Commander Nobile, the ship's designer, by the automobile club of Milan. It consists of a gold replica of the "Norge" above the top of the world, represented by a portion of a globe, incased in a base.

INSECTS BLOWN OUT OF LIGHTS WITH FANS FOR MOVIES

Swarms of moths and other insects, attracted by the bright lights in the motion-picture studios, were once a problem in taking indoor scenes because they were likely to register on the film when passing before the camera. The difficulty has been eliminated by sweeping the rooms with "bug machines"—airplane propellers driven by electric motors which prevent their intruding in the picture.

Dard Hunter with Sample of Mulberry-Bark Paper, Made by South Sea Islanders

PAPER FROM MULBERRY BARK USED FOR CLOTHING

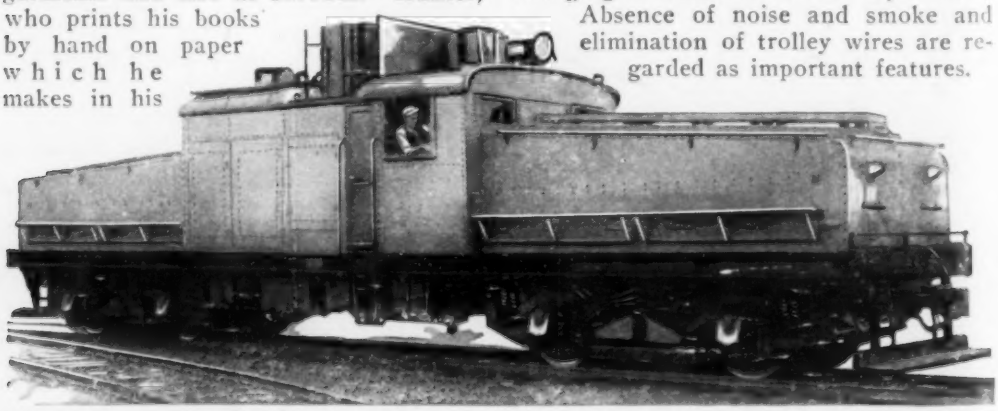
Cannibals are not commonly thought of as proficient in any skilled art, but Dard Hunter, author and publisher, found that certain South Sea island tribes are expert at making a kind of paper from the bark of mulberry trees. They use the material in brightly colored patterns for garments and also as shrouds. Hunter, who prints his books by hand on paper which he makes in his own one-man factory, has one of the world's most complete collections of ancient and modern paper.

PAVEMENTS ON CHICKEN WIRE CAN BE ROLLED UP

To be laid over a twenty-mile stretch of sand thoroughfare near Corpus Christi, Tex., lengths of chicken wire coated with elastic asphalt are planned for an automobile highway. If the necessity arises, the road could be rolled up and put away. The efficiency of this system was demonstrated during the World war, when Gen. Allenby used it in moving troops and trucks into Mesopotamia. The wire and its coating distribute the weight of vehicles so that they will not sink into the sand.

BIG STORAGE-BATTERY ENGINE TO SPEED SWITCHING

Faster handling of trains and cars in the switching terminal is expected with a storage-battery locomotive that can haul seventy empty or thirty loaded freight cars at speeds of from eight to ten miles an hour. The battery weighs more than thirty-nine tons and is the equivalent of 1,579 ordinary six-volt batteries such as are used in radio. They furnish power enough to crank 1,600 automobiles simultaneously. The locomotive can be recharged with special apparatus at night when not working or, in an emergency, can be supplied with power while in operation from a small gas-engine generator in the cab. One charging is sufficient for a day's work. Absence of noise and smoke and elimination of trolley wires are regarded as important features.



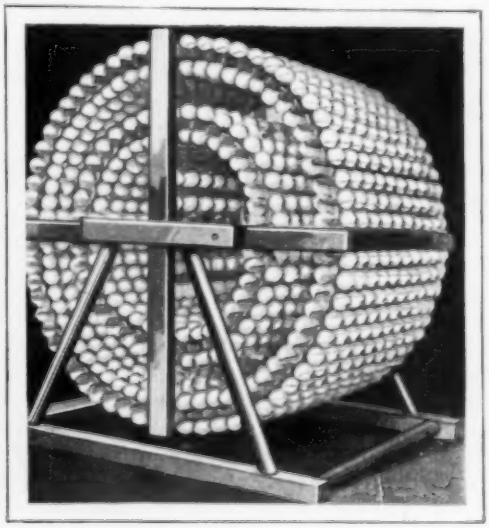
Huge Storage-Battery Locomotive for Railroad Switching Service; It May Speed Solution of Electrifying Big Terminals as Wires Will Not Be Needed over Switch Tracks

KITE CAMERA TAKES MOVIES OF TROOPS AT DRILL

For the first time in the making of motion pictures, successful films of troop movements at long range were obtained from a kite at Camp Stanley, Tex., not long ago. The camera, wound up with a spring, was set and released at a height of seven feet while suspended from the kite string. A butterfly contrivance carried it to a height of 1,000 feet and, as the camera came in contact with the kite, the wings automatically folded up and the instrument was carried back by its own weight. It had been operating by the spring mechanism during the journey, the result being that a panoramic view in steadily diminishing proportions was obtained. For taking battle scenes, a balloon camera has been devised. It weighs sixty pounds, the kite instrument only twelve. A gas bag carries the camera to a height of 100 feet and fifty feet of film can be taken.

STORE EGGS ON TURNING RACK TO PREVENT SPOILING

Contending that one of the chief causes of eggs spoiling lies in the common method of storing them upright, a German has designed a rack holding the eggs horizontally on cylindrical drums both inside and out. All that is needed to keep the eggs fresh is to give the apparatus a quarter turn every other day. A crank is provided for this purpose and a date index showing when the last turning was done helps eliminate mistakes and negligence. No chemicals or other preparations are used and, after candling, eggs have kept fresh for over a year. The apparatus is made in various sizes.



Storage Rack Filled with Eggs; It Is Turned Slightly Every Other Day to Prevent Spoiling

In Memory of World War Prisoners Who Died in Sweden; Unique Monument Erected at Trelleborg

SOLDIERS WHO DIED IN SWEDEN HONORED BY MONUMENT

A world-war monument for Sweden seems incongruous at first thought since that country was neutral during the struggle, but a memorial has been erected and unveiled in Trelleborg to recall one of the tragic sidelights of the conflict. It is in honor of the prisoners who died in Sweden while being exchanged between Germany and Russia. A stone shaft, surmounted by a bird apparently grieving for its dead mate at the bottom, is the conspicuous part of the memorial.

Vital Areas Protected from Bandits' Bullets; Berlin Policeman Wearing Flexible Chest Armor, and Metal Visor to Shield Head

BULLET-PROOF POLICE ARMOR EXHIBITED IN BERLIN

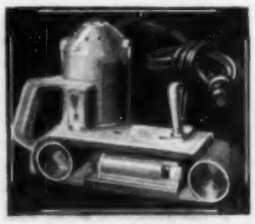
Breastplate and a headgear that partly shields the eyes are conspicuous units of protective armor devised for German policemen. The coverings are quickly adjusted or removed and are arranged to guard the vital parts of the body without interfering with the wearer's movements.

FIVE HUNDRED PATENTS A YEAR GRANTED TO WOMEN

Before the Civil war, less than half a dozen patents were granted women in one year, but the number has been steadily increasing until it is now above 500 annually. Their inventions cover almost the whole range of human activity and include a wide variety of articles from horse collars to windshield wipers. Most of them are within the scope of household appliances, but they include also articles for agriculture, manufacturing, mining, submarine warfare and fuel. As in the case of man's activity, necessity, as the mother of invention, has inspired many of the devices. A Texas woman wrote the patent office that she was tired of stripping sugar cane for molasses by hand so invented an appliance that did the work better. Another woman, confined to her bed by illness during the hot days of summer, noticed how poorly the room was aired, and devised a ventilator on which she was granted a patent. A woman golf player became vexed when she had to recover balls that lodged in difficult places and arranged a special rake for the purpose. It was later modified for garden use and patented. Wives of farmers have devised a number of things not only to lighten kitchen work but to relieve the drudgery of farm toil. A Minnesota woman obtained a patent on a portable smokehouse, the invention being the result of her resolve to make the task, allotted to her, easier and more successful. Because she was tired of bending her back continually while doing the work, a Florida woman rigged a fertilizer distributor and wrote the patent office that the implement was the product of "Yankee laziness." Many firearms have been invented by women, the list including automatic pistols, bomb-launching apparatus, a cane-gun, etc. The decade ended in 1867 saw an increase of 677 per cent in the patents granted to women over the preceding ten years.

SANDER FOR WOOD OR METAL RUN FROM LIGHT SOCKET

For smoothing wood or metal surfaces quickly and evenly, a portable electric sander can be operated on any alternating current from twenty-five to sixty cycles or with direct current of 110 volts. It is shaped somewhat like a plane and is equipped with a moving belt that does the sanding. This may be changed, and so may the block with it, so that the sander can be applied to a wide variety of surfaces and materials. The right-hand side is clear so that the belt can be operated close to a baseboard or wall. The implement weighs but twelve pounds.



OSTRICH LEATHER MAKES FINE SHOES

Because of the demand for their leather, ostriches are coming to rival cattle in some parts of South America, according to reports. The skin tans a beautiful shade of brown and the quill sockets, showing as a deeper shade, afford a pleasing contrast to the smooth surface. The leather is also being used for handbags, brief cases, show trimmings and other articles.

ARCHER HOLDS BOW IN FEET FOR TRICK SHOTS

Like the rifle marksman, the archer is able to demonstrate his skill by novel shooting positions. At an eastern meet, one contestant adopted a method used by some tribes of savages, that of holding the bow against the soles of the feet with the arrow between them, then drawing the string back with the hands and shooting. A stiff bow can be managed more easily in this manner, and steady aim is possible after practice.

Giving Archery a New Twist; Holding Bow against Soles of Feet for a Trick Shot

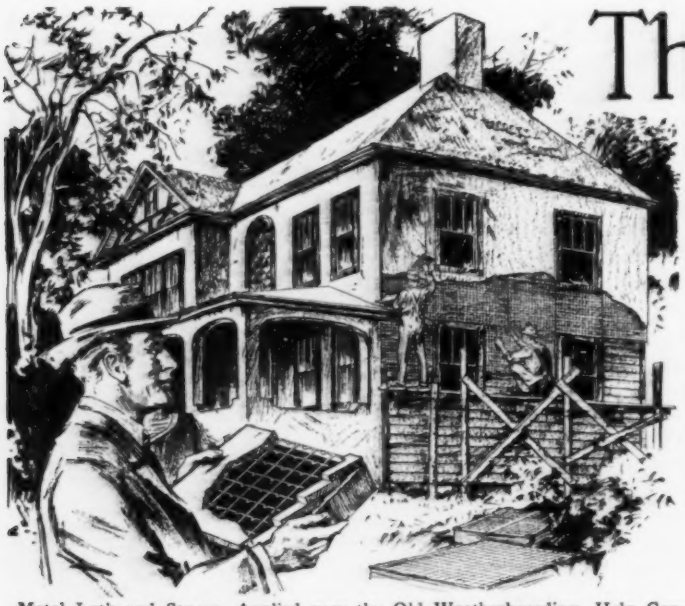
Gas-Generating Plant for Homes Not Served by City Supply; Outfit May Be Set Up Far from the Range

HOME GAS-GENERATING PLANT REDUCES COOKING COSTS

For homes in localities that are not supplied with gas but have electricity, a generating plant that uses gasoline is said to afford sufficient fuel for ordinary cooking at a cost less than ten cents a day. It consists principally of a tank containing wicking saturated with gasoline and through which air is forced to effect vaporization. A suitable mixture of gas and air is obtained, and to operate the outfit, it is only necessary to fill the tank once in six months, push an electric button, and the gas is soon ready for use. The tank may be placed in any convenient location, an automatic arrangement insures a constant supply of gas, and the fuel is said to have a heating value of 870 British thermal units. Safety is assured, the manufacturers assert, and the tank may be set up at some distance from the range and the gas piped to the burners.

¶The United States has a million and a half more automobiles than telephones.

Things to



Metal Lath and Stucco, Applied over the Old Weatherboarding, Help Convert an Aged House to Smart and Modern Appearance

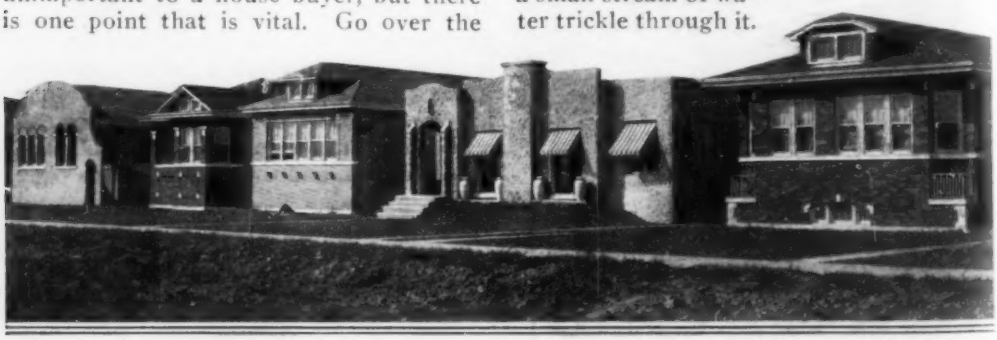
By A CONTRACTOR

"THE trouble with building good houses is that the average buyer does not know whether they are well built or not and will buy a poorly built house that is all dolled up rather than a good house for the same or very little more money."

This was the verdict of a real-estate dealer who went on to tell many instances of cheaply built houses that had sold for good money in preference to well constructed ones, as well arranged and as sightly, but not fitted up to catch the eye of the buyer.

To begin with there are three grades of lumber. Most details of grading are unimportant to a house buyer, but there is one point that is vital. Go over the lumber used in the house and determine if it was cut from a live tree or from a tree that had died on the stump or become overripe before cutting. Wood from a live tree is alive. When bent, it springs up to the point of breaking and snaps when broken. Wood from a dead tree will break like a piece of cheese and the ends will not show any fiber. Live lumber, properly painted, will last practically forever. Dead lumber will not last a generation. It already has begun to decay and will not hold nails.

When you start building, the first thing to watch is the foundation. Concrete properly mixed will become stronger every year. Improperly mixed, it will gradually break up and your basement will be damp. Good concrete should have a full shovel of cement for every three shovels of sand and four shovels of gravel. See that this shovel of cement is as full as the shovels of sand and gravel. Then look well to the sand you use. It should be clean and sharp. Take a handful, when moist, and squeeze it in your hand. If it clings together take it to a faucet and let a small stream of water trickle through it.



The Kind of House Your Neighbor Builds Influences the Value of Your Own; Here Is a Row of Bungalows, All Good in Themselves, but Spoiled by Unwise Mixture of Clashing Types

Look For *in* Buying a Home

Skintled, or Staggered Brickwork, Relieves the Dull Plainness of Ordinary Laying, and Adds Charm to a House; Note the Convenience of the Built-In Garage, Which Is Easily Heated

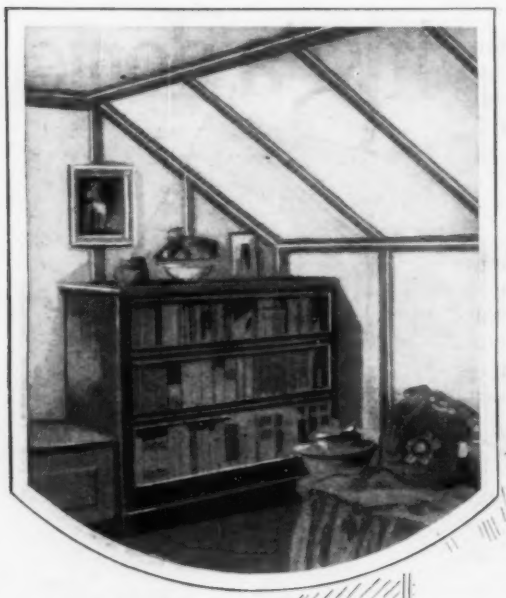
If the water comes out clean, all right, if the water is discolored, the sand has not been properly washed and your concrete will not be as strong.

If you are having a wall poured, be sure it is not stripped of its form for at least two weeks, particularly if the weather is clear. Sun on green concrete will practically ruin it. In any case, see that the concrete is kept wetted down. It is a false notion that concrete dries out. The water does not dry out, at least not all of it. It unites with the cement in a chemical combination and, if there is not a proper amount of water present until this reaction takes place, the concrete will not become as strong as it properly should be.

If the house you are buying does not have a full basement, insist on having a layer of waterproof paper between the courses of flooring. This will prevent the moisture from coming up into the house. Be sure that there is also a layer of paper between the inside and outside wall sidings and that it is properly placed around the window and door openings. This will save you tons of coal every year. The paper should be put under the window frames before they are nailed on and should have plenty of margin for laps.

See that the house was leveled up before plastering. Builders are prone to level a house when they are framing it and then forget that it may settle. If you wait until it is plastered, it may be too late, for any change of levels will crack the plaster

The Spanish Type House in the Foreground Is Good, and the Plain Bungalow Next to It Is Fair, but the Appearance of Both Is Lessened by the Incongruous Designs



Wallboard Offers a Quick and Cheap Method of Making an Old Attic Attractive; at the Bottom Is an Example of Inferior Painting, Put On Just to Sell an Old House

and probably cause it to drop off. When you buy a house look into this matter. If it has not been done, don't buy the house. Rocking chairs will travel on a floor that is not level and, if you spill water, milk or any other fluid on it, it will run away from you instead of remaining to be wiped up.

Inspect the shingles. If the roof is steep, it will be all right if there is an exposure of five inches to the weather, but if it is flat, not more than four inches should be allowed. With many, shingles have come into disrepute. This is because people have used a cheap grade, cut thin and from poor timber, which will crack when dried out in the sun. A good shingle should be of live cedar, clear of knots, and the thick ends of five shingles put together should measure not less than two inches. Shingles should be laid with galvanized nails. Blued steel nails will rust in two in a few years and the shingles will work loose. Shinglers do not like to put galvanized nails in their mouths and consequently advise against their use.

Nor should shingles be treated with anything containing free carbolic acid as it will attack the nails. It is not the exposed part of shingles that decays but that under the lap. If you are building a permanent home, dip the shingles in a stain, the major portion of which is boiled linseed oil, and your roof will last practically forever. When you buy a house, see what kind of siding is under the paint. If it is cedar siding, or other wood, be sure it is placed with the grain vertical. The outside paint of a house suffers a heavy ordeal combating the summer's sun and the winter's frost, besides exposure to wind, rain, soot and sand. If the wood has a vertical grain, it offers a footing for the paint on which it can keep hold, but if there is

© Creo-Dipt Co., Inc.

Shingles Dipped in Gray Stain and Applied over the Old Walls Helped Remodel This House into the Pleasing Colonial Home Above

a slash grain, you will find the paint slipping at the end of the second year.

Coming to siding, brings up the subject of paint. There is only one real good base for outside work and that is linseed oil. It combines with the oxygen to form a hard surface. Linseed oil and paints made from it are more expensive, but though you may save half the money by buying cheap paints, they will not last.

As to inside finish, the first thing the average buyer asks is shiny hardwood floors. A shiny floor is the easiest and cheapest finish to obtain. The floor is laid, scraped, sanded, filled, wiped, sanded, shellacked, sanded again and then polished with wax. That makes a beautiful finish for a few weeks. But the first time a heavy chair is slid across it, however, there will be a scratch that nothing but refinishing will remove.

The good and permanent floor finish is wax, or oil. As soon as shellac is put on wood, there is a new surface through which wax or oil will not go. So, if you use wax afterward, it means nothing more than a polish on the shellac, and any scratch cuts through and shows. If the shellac had been left off, the wax would have entered the pores of the wood and every additional coat would have made the floor harder and handsomer. But this is not a highly polished floor to start with and it will not be so for a number of years. Eventually it will have the color and polish of old country floors, but not at once.

Veneer hardwood floors are easier to take care of than tongue-and-groove hardwood floors thirteen-sixteenths of an inch thick. If a board is injured through any cause, it is easily removed from a veneer floor and another substituted. Also you will find the thick floors will "cup" or warp in damp weather, or if water is used on them.

When you look over your prospective house, take a straight stick with you, about four or five feet long, and lay it along the plastered walls. Put one end of it up near a door or window casing and see if the plaster recedes from the middle of the stick. If it does, the plasterer has "cheat-

ed" the wall, making it three-quarters of an inch thick at the openings where the grounds force him to do so and then scraping it away as soon as he has got away from the grounds. If this is the case, the plaster will be apt to crack and fall away from the lath.

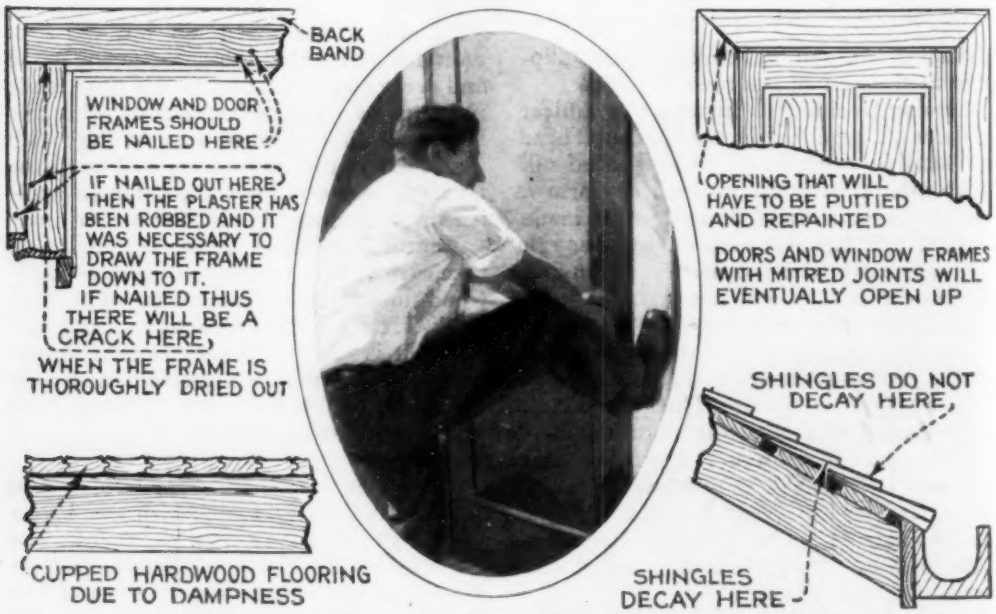
See to it that your ceiling joists and studs are spaced sixteen inches apart. Where possible, unscrupulous builders will space them two feet. It is easy to knock on the plaster with your knuckle or a hammer and determine the location of studs and joists, and if you find them more than sixteen inches apart, don't buy the house, for ordinary lath will not stand the strain of so long a span and your plaster will come off. Also, if you can find a place where the plaster is exposed, see if the lath have been put on far enough apart so that the plaster was forced between them. This takes more plaster, and it will eventually fall off if not keyed on this way.

For a number of years driftwood gray has been a popular finish. This has been accomplished by the use of a number of different stains. If you contemplate buying a house with a stain finish, remember that unless the stain has a varnish, shellac or wax finish, it will show a greasy stain for every finger mark.

Look at the frames around the inside of your doors and windows. If they have mitered corners, find out how long they have been on and painted. In practically every case a frame with a mitered corner will shrink and the mitered joint open up, leaving an unsightly crack. Examine also how the door and window frames are nailed. If this has been done only along the inside edges and yet the outside edge lies flat against the plaster, you will be safe in buying, but if the frame is nailed along the outside edge, to hold it in place against the plaster, then the plastering has been cheated and, when the door frames shrink —as they surely will—they will pull apart at the joints and leave cracks.

Tile floors and drainboards are popular now, as a sanitary measure. Tile floors are fine in buildings and homes with plenty of help, but the prospective buyer of a small house would do well to consult some friend who has tiled floors before closing the deal. Tiled floors show dirt at once and are not readily cleaned. Tile drainboards around sinks also need to be cleaned frequently and it is well to remember that your fine china or glassware is never safe from chipping if you do not set it down with great care.

Look over the hardware. You know


BACK BAND
WINDOW AND DOOR FRAMES SHOULD BE NAILED HERE
IF NAILED OUT HERE THEN THE PLASTER HAS BEEN ROBBED AND IT WAS NECESSARY TO DRAW THE FRAME DOWN TO IT.
IF NAILED THUS THERE WILL BE A CRACK HERE, WHEN THE FRAME IS THOROUGHLY DRIED OUT
CUPPED HARDWOOD FLOORING DUE TO DAMPNESS
OPENING THAT WILL HAVE TO BE PUTTIED AND REPAINTED
DOORS AND WINDOW FRAMES WITH MITRED JOINTS WILL EVENTUALLY OPEN UP
SHINGLES DO NOT DECAY HERE,
SHINGLES DECAY HERE

Here Are a Few Things to Look For When Buying a Ready-Built House; They Also Indicate Dangers to Avoid When You Plan to Build a New Home, for All Mean Trouble Later

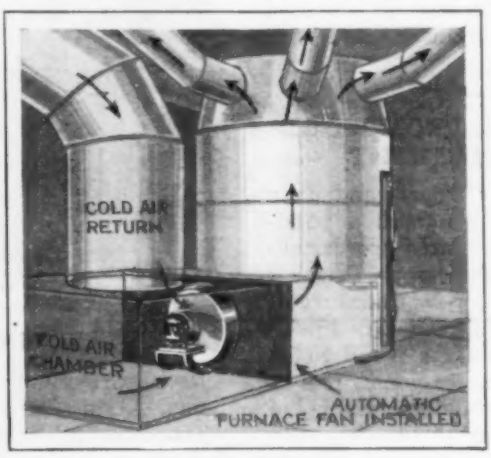
what a nuisance it is to have the small screw that holds the doorknob come out and leave the knob in your hand. Good hardware will have the screw made of hard material so that the threads will not wear off and the screw drop out. Or, better still, they will be equipped with screw-on knobs which can be adjusted so that they will not rattle.

When you go out with a real-estate salesman, he will, nine times out of ten, take you to the back door, or leave you standing at the front door while he goes to the rear and lets himself in with a pass key. Usually, you will find an expensive burglar-proof lock on the front door while the other outside doors are fitted with ordinary locks which you can open with a piece of wire, or a pass key.

Look around the grounds and the builder's shed. If you see any box nails, don't tarry. They are too slim for house work, bend too easily and do not hold in the wood. But the worst thing about box nails is that the heads are made so thin that if they are driven home, as they should be, the heads break off and they have no holding power.

AIR FAN FOR FURNACE HELPS COOL HOUSE IN SUMMER

More heat in winter, better ventilation at all times and a supply of cool air in the summer are results claimed for a force fan for the hot-air furnace system. It is provided with louvers which automatically open or close to maintain balanced conditions. Loss of radiant heat in the cellar is reduced, interiors are warmed up more quickly, the manufacturers declare, and when the fan is operated in the summer, it causes cool air to circulate through the house from the basement.



Drawing Illustrating Where Fan Is Installed and How It Circulates Cool Air in Summer

Meat of the musk ox is said to taste much like beef.

Motion-Picture Card in Position for Changing the Faces, and Two of the Portraits Produced

FACE IN CARD MOVES AS EDGES ARE PRESSED

"Moving pictures" produced by squeezing the back of a small cardboard frame furnish a wide range of widely different faces in a new pocket novelty. As the back is shifted from side to side by the pressure of the fingers, a constant procession of faces form and disappear.

CAN READ FORTY MILES AWAY IN SEARCHLIGHT'S BEAM

Beams from a 2,000,000,000 - candlepower searchlight, recently completed, are said to be so powerful that, on a clear night, a person at a distance of forty miles from it could read a newspaper by its light. This is regarded as a record in artificial illumination and the light is proclaimed to be the largest in the world.

Workmen Coating the Exterior of the Buckingham Memorial Fountain with Waterproof Material to Protect the Marble

WATERPROOFING STONE ADDS TO ITS DURABILITY

To prevent damage by water and freezing, the outer surface of the $650,000 Buckingham memorial fountain in Chicago was treated with a liquid preparation having a paraffin base. A blowtorch was first applied to expand the material so that the liquid would penetrate the open pores to an effective depth. The process is said not to change the color of the marble but rather to intensify the delicate markings, and is intended to last for twenty years. Similar treatment was used on Trinity church, at Broadway and Wall street, in New York.

SUGAR PREPARED FROM WOOD BY ACID TREATMENT

Production of sugar from wood on a commercial scale is considered a possibility as a result of a patented process developed by a German professor. Sawdust is treated with a forty-per-cent mixture of hydrochloric acid in special containers, causing the cellulose in the wood to be converted into glucose. It comes out as a grayish powder containing ninety-five per cent sugar and can be used directly for cattle feed and, after being refined, for human consumption.

LUCK IN THE LABORATORY

An element of luck often surrounds great discoveries. Dr. Alfred Russel Wallace was writing a treatise that developed approximately the same points when Darwin published his "Origin of Species." Marconi is the recognized inventor of wireless, but Sir Oliver Lodge had managed to send wireless messages across a laboratory before Marconi's findings were made known. Sir William Crookes stumbled upon the X-rays while making some photographs, but did not explore them further just then, intending to make a more thorough investigation later. His delay robbed him of a great victory. When he returned to England from Berlin, where he had been studying, the world was ringing with the name of Prof. Roentgen who had made public the discovery of the mysterious rays.

HANDLE FOR ELECTRIC PLUG REDUCES SHOCK HAZARD

For electric-cord plugs, an insulated handle simplifies attaching to sockets, prevents accidental contact with live wires and also helps preserve the cord. For connection to lamp sockets with shades it is not necessary to remove the latter.

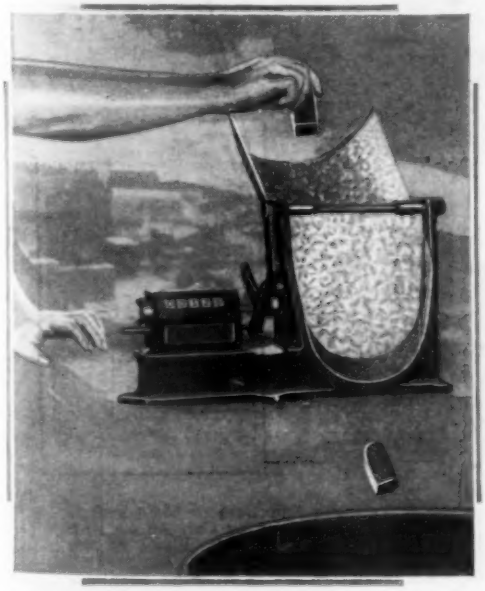
JEWELS IN INDUSTRY

Jewels are usually considered as ornaments, but as bearings for watches and other small instruments they are in great demand, several million being used in the United States alone annually. Many are

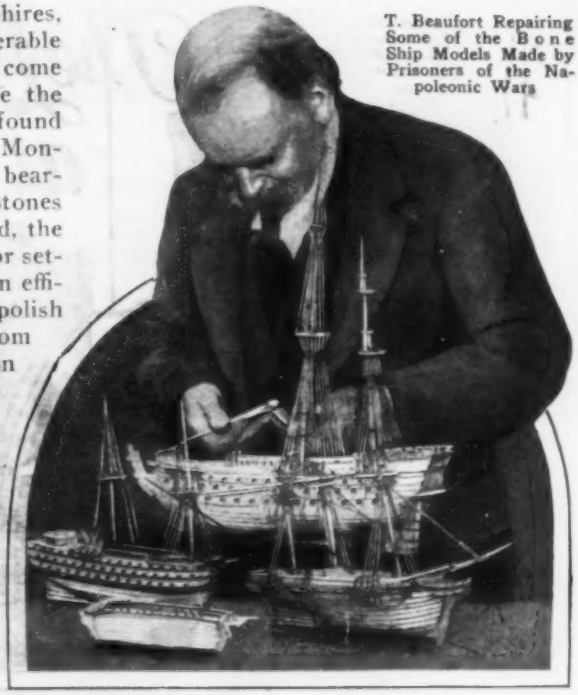
mined and cut in this country. Sapphires, for instance, are found in considerable quantities in Montana, while many come from Ceylon and Australia. While the usual color is blue, they are often found in all the hues of the rainbow. The Montana stone is said to be the best for bearings as it is less brittle. When the stones come from the mine, they are sorted, the more valuable ones being reserved for settings in rings and other jewelry. An efficient workman can turn, drill and polish as many as 100 sapphire bearings from small stones in a ten-hour day. In producing jewel bearings for some of the finer instruments considerably more time is required.

SHOP COUNTER RECORDS SMALL-PART OUTPUT

Accurate record of production of small parts is kept by means of a counter connected to a hopper through which the pieces may be passed to packing cases or storage bins. The small chute is tipped up sufficiently, as the articles slide down, to actuate the register. The arrangement eliminates errors and saves the trouble of mental calculations and counting. The unit is easily set up in any part of the shop.



As Pieces Fall through Hopper, the Chute Tips, Registering the Count on Indicator at Left



T. Beaufort Repairing Some of the Bone Ship Models Made by Prisoners of the Napoleonic Wars

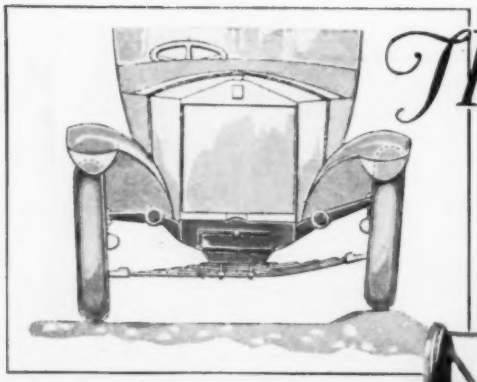
SHIP MODELS MADE OF BONES ARE VALUED HIGHLY

Repairing the bone ship models made by prisoners during the Napoleonic wars, is the odd task of an English craftsman. The materials used in the replicas were obtained from the cookhouses. Some of the models are valued at sums ranging from $1,250 to $5,000.

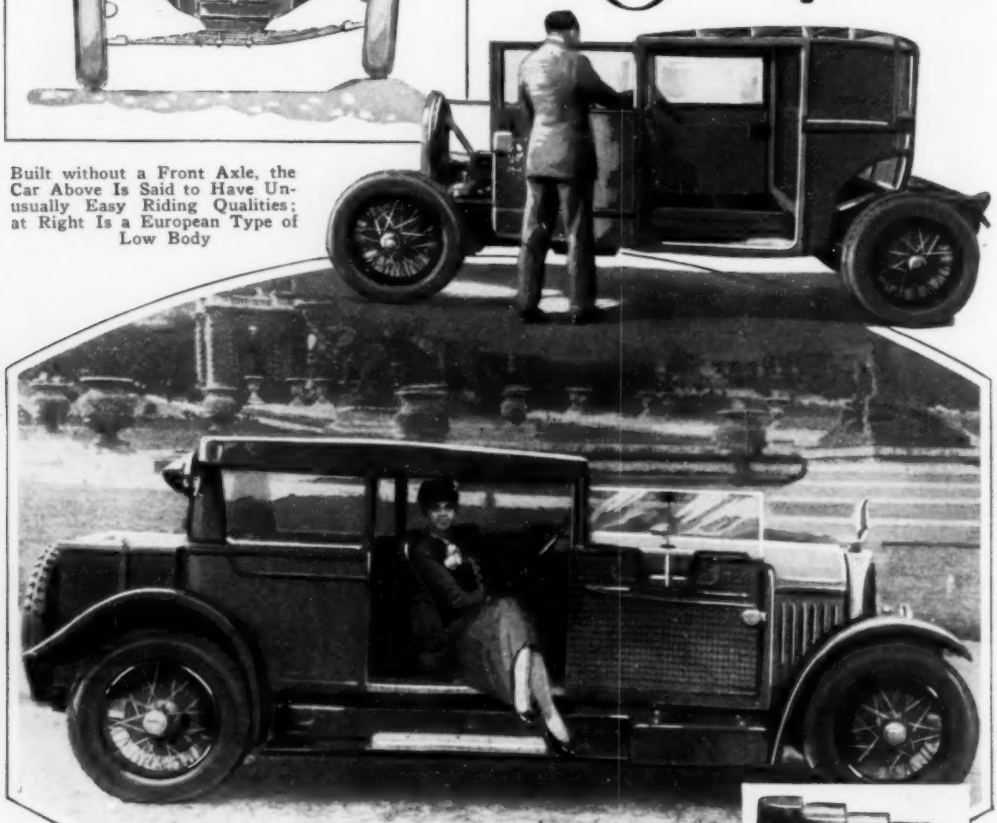
PICTURES OF BRAIN MESSAGES TAKEN BY WIRELESS

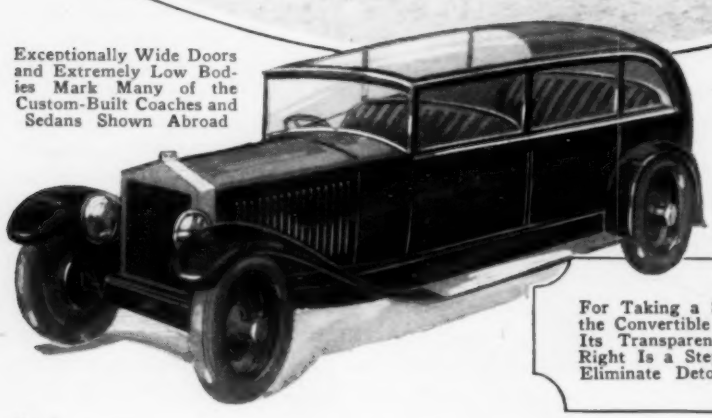
Photographic records of messages sent to the brain by nerves are taken with an adaptation of radio apparatus by a European scientist. The instrument is fitted with an amplifier by means of which the nerve impulses are magnified and the impressions are translated into codelike dots and dashes on a photographic plate. The outfit is said to be so sensitive that it records the messages sent to the brain of a frog when the creature's skin is pressed or pricked, and it is being used to study the results of nerve stimulations in human beings, as in the case of a nerve fiber at the end of the finger being pricked with a needle.

The LATEST at European



Built without a Front Axle, the Car Above Is Said to Have Unusually Easy Riding Qualities; at Right Is a European Type of Low Body





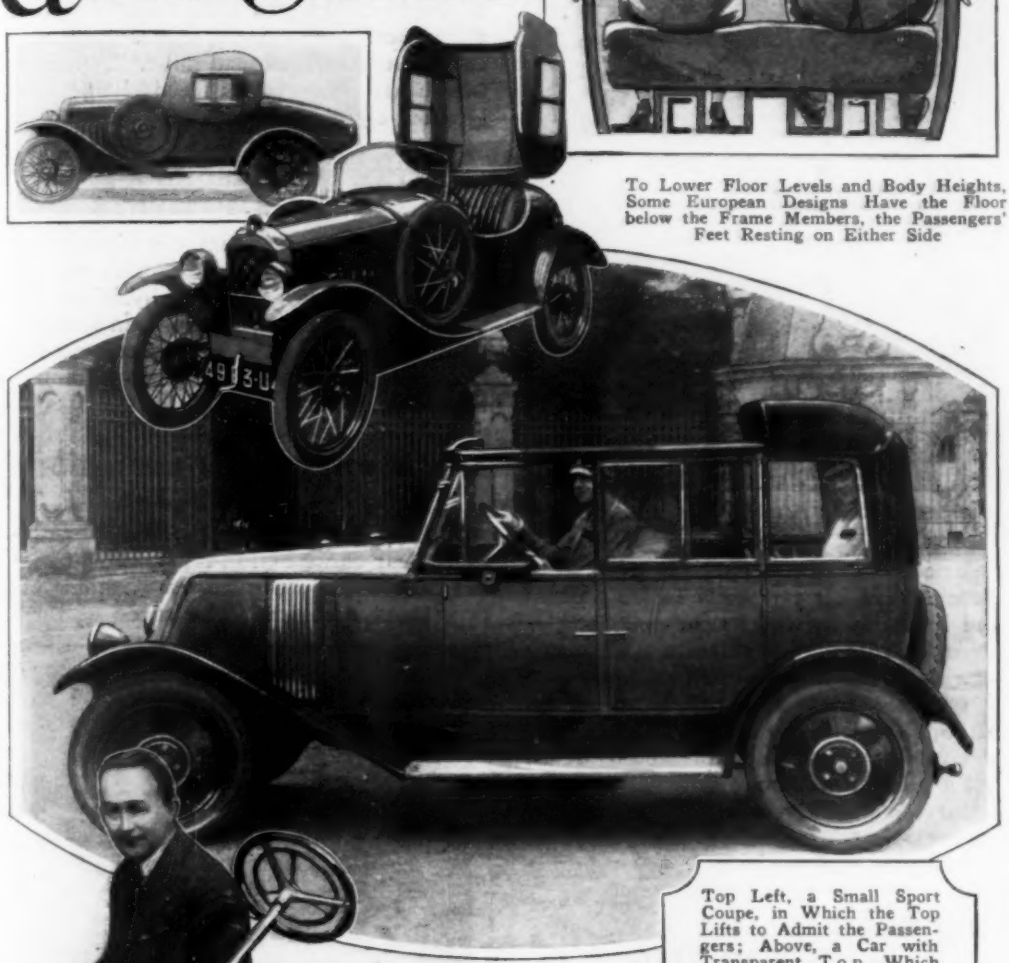
Exceptionally Wide Doors and Extremely Low Bodies Mark Many of the Custom-Built Coaches and Sedans Shown Abroad

For Taking a Sun Bath or Sight-Seeing, the Convertible Touring Car, Above, with Its Transparent Top, Is Ideal; at the Right Is a Step-Top Piston, Designed to Eliminate Detonation at High Pressures

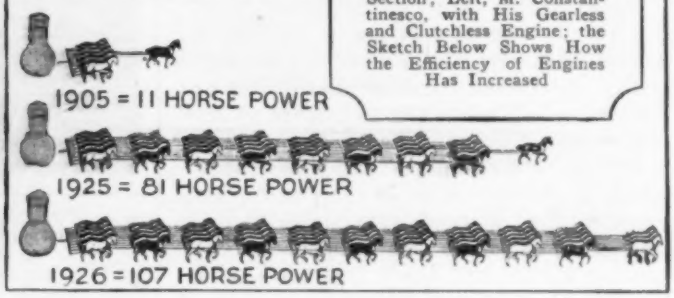
Courtesy

THINGS seen at Auto Shows

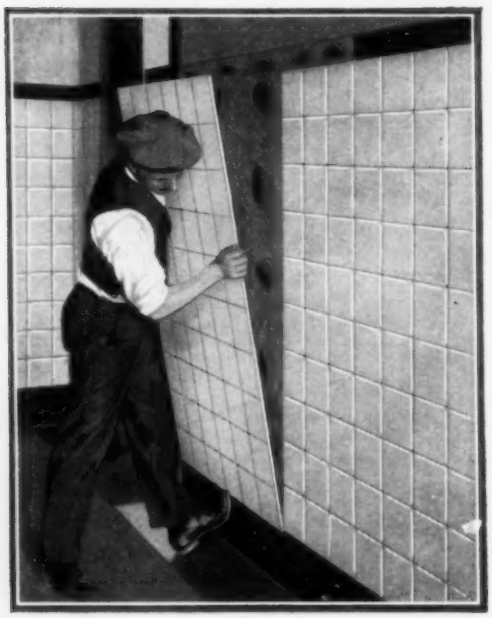
To Lower Floor Levels and Body Heights, Some European Designs Have the Floor below the Frame Members, the Passengers' Feet Resting on Either Side



Top Left, a Small Sport Coupe, in Which the Top Lifts to Admit the Passengers; Above, a Car with Transparent Top, Which Rolls Back in the Fixed Section; Left, M. Constantinesco, with His Gearless and Clutchless Engine; the Sketch Below Shows How the Efficiency of Engines Has Increased



BATHROOM AND KITCHEN TILE MADE IN LARGE UNITS



Fitting Slab of the New Tile to a Wall; Its Qualities Permit Using It for Repairs

A new form of tile, specially adapted to refacing old plaster walls in bathrooms and kitchens, as well as for new jobs, is made in large sheets, ruled in tile pattern or with plain surface, which can be quickly installed with a minimum of joints. Although the material is guaranteed to be non-absorbent and unaffected by acids, and is cleaned without alteration in color, texture, or polish, it likewise is easily cut, so that slabs can be fitted to off-size rooms or irregular wall surfaces.

FIND MINERAL THAT EXPLODES IN MEXICAN MINE

An explosive mineral and crystals of gypsum the size of a post are among the rarities discovered by Dr. W. F. Foshag of the Smithsonian Institution during an expedition in Chihuahua and other states of northern Mexico. The strange mineral is called "Hillebrandite" and has been found in no other place in the world. Its discovery was marked by a series of explosions in the mine where men were extracting silver ore. They had the sound and effect of charges of dynamite, cracking out great gaps in the tunnel. The action is believed to be due to high pressure, that is, the space in which the mineral was formed was insufficient for it and as soon as the tunnel gave it an outlet, it burst. The same mine also produced Velardenite and Spurrite, other uncommon minerals. All three were found in great quantities. The gypsum was dug out of a cave in a silver and lead mine. The crystals measured up to six feet in length and between eight and ten inches in thickness.

METER TO MEASURE X-RAYS PROTECTS PATIENTS

A meter that registers the strength of X-rays being administered to patients, has been devised by a Vienna physician. In the past, severe burns have been suffered from exposure to the substance, and the new instrument is expected to eliminate this risk.

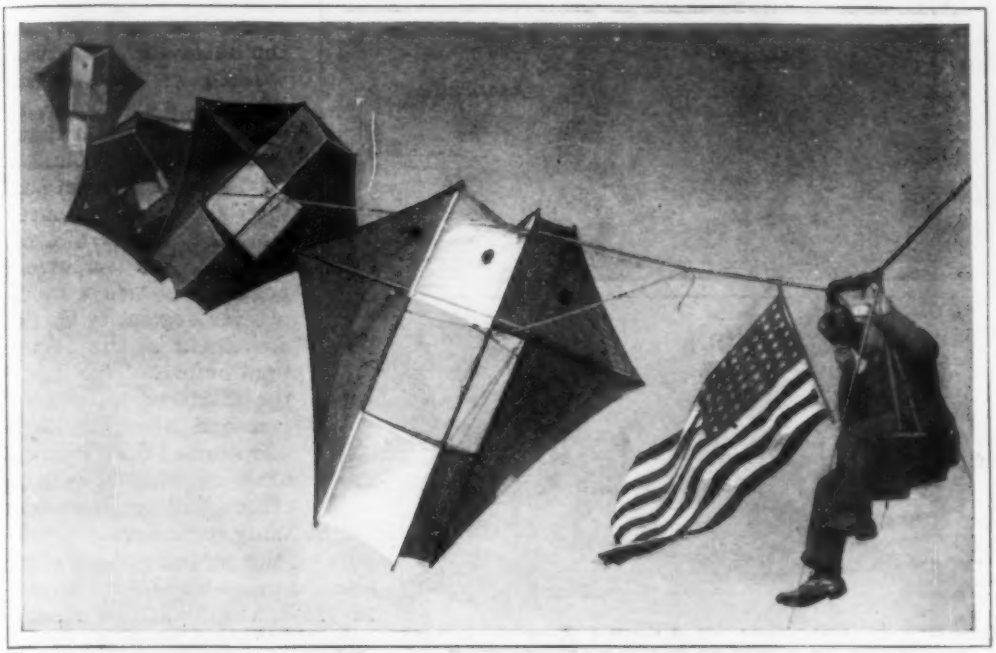
ARMOR EXPANDS WHEN STRUCK BY BULLETS

Lightweight metal prepared for armored-car construction is so resilient that it expands and stops bullets without letting them through. The force of their

Sample of the Metal after Bullet Bombardment; Missiles Dented but Did Not Penetrate Material

flight is taken up in the expansion of the material.

MAN-LIFTING KITES USED IN TAKING PHOTOGRAPHS



Proving That Kite Flying Is Not Always an Idle Pastime; Supported by This Chain of Powerful Flyers, Photographer Was Able to Take Movies at Height of 150 Feet

That man-lifting kites can be made to serve a further practical purpose was demonstrated in an eastern city recently when a photographer was raised to an elevation of 150 feet, by a string of them, for taking motion pictures. Kites of this type have been carried on Arctic trips for suspending radio antenna and to aid in making observations.

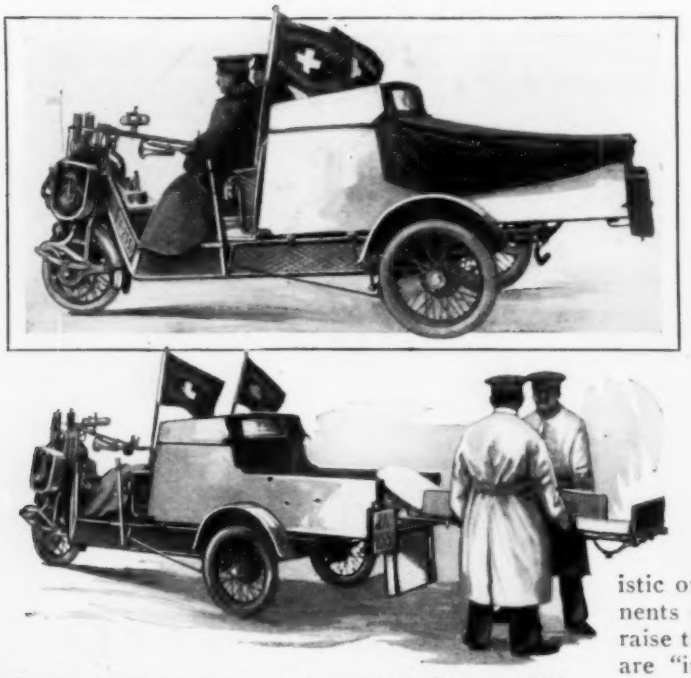
STADIUMS OF TODAY RIVAL THOSE OF ANTIQUITY

There are ten stadiums in the United States with a seating capacity of more than 50,000 persons each. The famous Greek amphitheater at Olympia, where the Olympian games were held, accommodated only 45,000, and the great Roman Colosseum at one time held 87,000, although some reports state that its original seating capacity was but 45,000. The Yale bowl holds 80,000, more than 140,000 persons were seated in the stadium at the Sesquicentennial exposition in Philadelphia, and the stadium on Soldiers' field, Chicago, will accommodate 100,000. The ponderous wooden Circus Maximus was rebuilt after the great fire in Rome and, according to the historian Pliny, had room for 250,000, while some writers place its capacity at 485,000.

MAGNIFIER ON HAND STRAP LEAVES FINGERS FREE

To simplify the tasks of dentists, jewelers and others who frequently do delicate work, a magnifying glass supported on a band strapped about the hand, permits the full use of all fingers. It is sufficiently wide to help illuminate the object under examination as well as magnify it, and correct focus is easily obtained by moving the glass up or down on a sliding rod.

¶Write our Bureau of Information if you wish to know who makes or sells any article described in this magazine. Send no postage; the service is free.



Tricycle Ambulance Covered and Attendants Removing Sliding Stretcher; Vehicle Is Intended for Use in Crowded Streets

TRICYCLE AUTO AS AMBULANCE GIVES QUICK SERVICE

High speed and ease of operation in crowded streets are advantages of a tricycle motor ambulance lately introduced in Berlin. There is a cot for one person at the rear. The vehicle has a front-wheel drive and is especially useful in minor accidents that do not require larger units.

BOY IMPROVED STEAM ENGINE MODEL EXHIBIT SHOWS

One of the most interesting exhibits among the patent models in Washington is a collection of miniature steam engines. Successive steps in the development of the giant of modern industry are illustrated in models of the engines made by Hero of Alexandria, by Newcomen and by Watt. There is also a replica of the early beam type upon which boys were employed to operate the cocks that turned the steam on and off. One of these boys, Humphrey Potter, instead of settling down like a machine to the monotonous work, kept his eyes open. He observed that the beam above his head worked in unison with the cocks when he opened and closed them. Accordingly, he connected the two and after seeing that the arrangement worked properly, ran off to play. His employers began to notice a much greater regularity in the movement of the engine than before. This led to the discovery of the secret and the consequent adoption of the device on other engines. This "afterthought" is characteristic of many inventions. Opponents of the patent system often raise the point that all inventions are "in the air," that the same suggestion sooner or later will come to a great many different persons and, hence, that the patent is simply a reward to the one who happens to arrive first.

ROLLER RUN OVER HIDE TELLS EXACT SIZE OF CATTLE

With a view to determining the amount of animal heat given off by cows, horses, sheep and other stock, in connection with

Measuring Cow with the Roller "Yardstick"

Stovepipe Boat as Single-Seater, a Pontoon, and Oarsman Assembling the Craft

studies of better stabling and feeding methods, investigators at the university of Missouri have been using an ingenious "yardstick" to measure the size of the animals. It is a brass roller of known area and has a chalk marker and a registering dial which counts the revolutions as it is drawn over the beast being measured. The chalk marks indicate the correct position for the instrument at each lining. The accuracy of the gauge is indicated by results obtained with a Holstein cow. The roller showed that it measured 42,635 square centimeters in area. After slaughtering, the hide was found to be 42,883 square centimeters.

¶ Names and addresses of manufacturers of articles described in this magazine will be furnished free by our Bureau of Information.

BOAT MADE FROM STOVEPIPE FOR WATER SPORTS

Lengths of stovepipe formed into pontoons and made rigid by crosspieces, have been fashioned into a gliding boat for water sports by a German enthusiast. The craft is collapsible and can be hauled about in a box, which is fitted with wheels for land travel and adjusted as a seat when the boat is in use. Only a few minutes are required to take the outfit apart or assemble it.

COLOR-MAKING NAVAL SHELLS

Specially prepared dyes in containers fitted to the nose of shells fired from naval guns and scattered by means of a small detonating fuse have been adopted by ordnance experts to color the water the missiles throw up and thus enable the marksmen on different ships to determine which shots register. The coloring is distinguishable at from fourteen to twenty miles, and dyes the entire mass of water. Different colors are given to the participating ships.

Contact with the Enemy

By G. K. SPENCER

Signalmen Wigwag Code Messages, While Companions, with Glasses and Blanks, Record the Answers

IN the soft summer night, the United States fleet, accompanied by its aircraft carriers, was lurching through a western Pacific sea on the eve of a war game with the mythical empire of Karmania. Each ship was in possession of orders for the morning attack. It was recognized that the fleet was more than able to meet the enemy on the high seas, but also that it could not suffer a defeat, for the fuel supply would be so reduced by maneuvering and smoke making that, if defeated, it could never survive to safely reach the land.

Consequently, Admiral Seifert reasoned that the enemy, sure of victory or at least safety, would permit the Americans to attack his land defenses in order to still more deplete the fuel reserves, so that further action would be an impossibility for them, with the Karmanian fleet held at a home base and only its cruiser squadrons patrolling the seas. The admiral had decided to fight out the action instead of retreating to the Hawaii base.

The rain clouds passed, and with the coming of sunrise, an intense activity began. Air squadrons were now droning over the fleet. Knowing that the enemy had been informed of the approach of the Americans, no attempt was made at radio secrecy, for there was but one position on the island-base coast upon which a landing could be made. A string of brilliantly colored bunting suddenly sprang to the fore trucks of the "Colorado." The signal was:

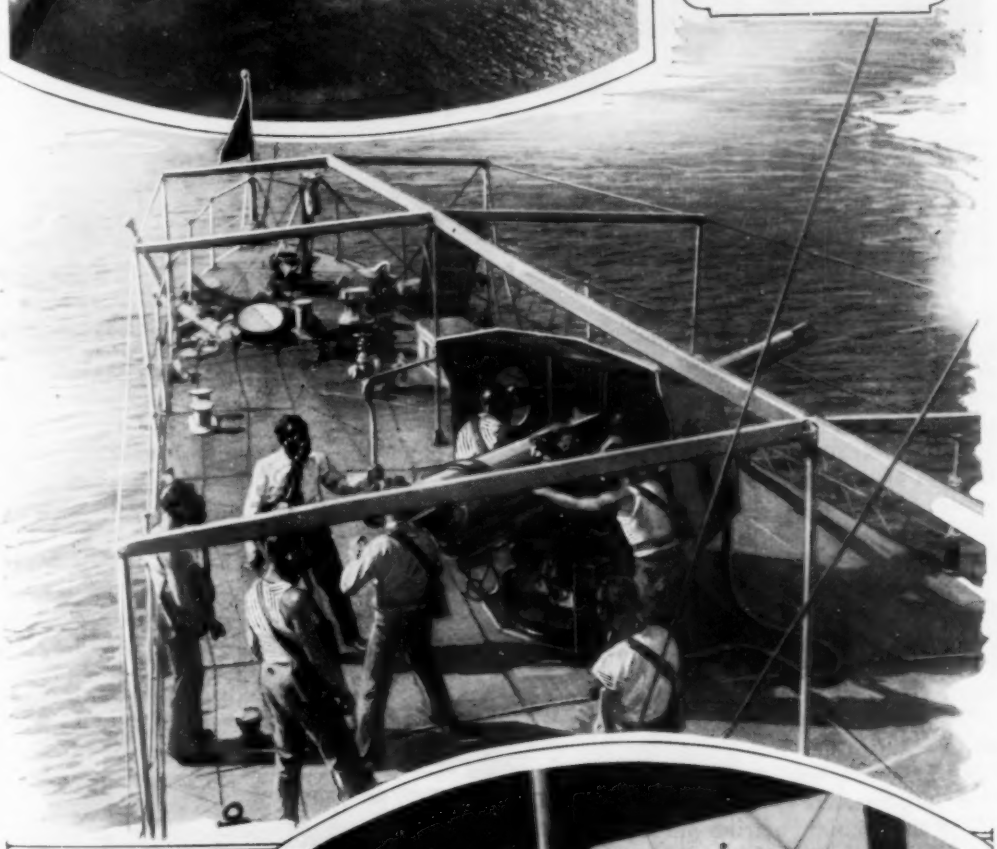
"U. S. S. 'Holland' stand in to fleet center, with one squadron of destroyers escort, and stand by to launch tanks."

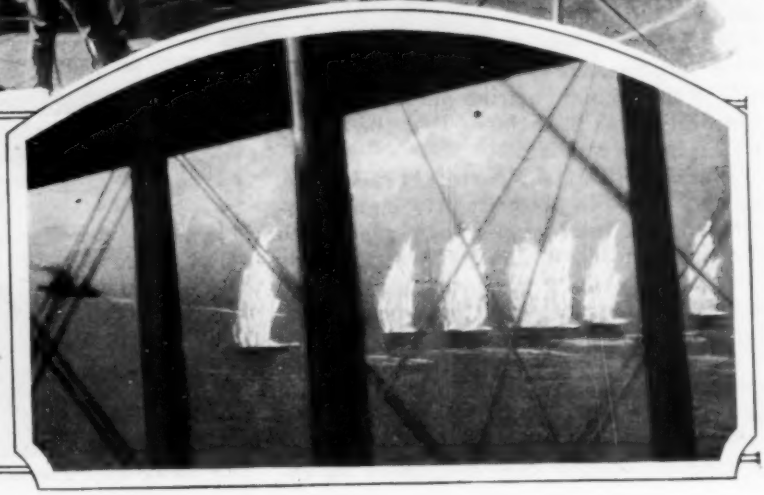
The "Holland," a submarine tender, stood in from her cruising station and began to launch overboard a great number of curiously box-shaped affairs. These were secured to the after decks of submarines. As rapidly as one submarine received its load, another cautiously came in to port or starboard.

The sea, after the night of rain, had cleared and, fortunately, was calm enough to permit sending the tanks overboard. The "Holland" aided this calm by pumping liberal quantities of oil on the water to quiet the slight choppiness which still prevailed.

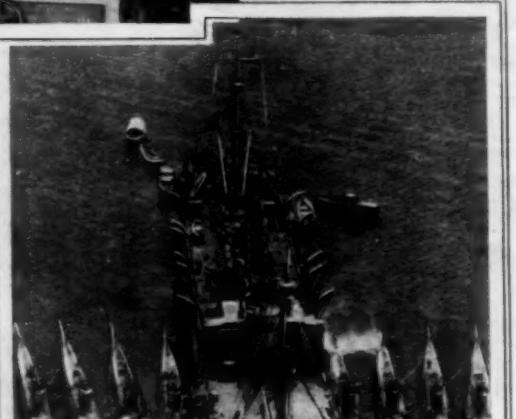
When the work had been all but completed with the fleet still well out of sight of the enemy base, and with more than forty submarines running abreast on the

Black Smoke Begins to Pour from the Destroyers as the Order Comes to Lay Down a Covering Screen for the Advancing Battle Fleet; Below, Gunners Serving the Bow Rifle of a Destroyer Wear Their Masks for Protection against Enemy Gas Shells When They Prepare to Attack Their Submarines





Closely Spaced, but Falling Short, the Enemy Shells Send Huge Geysers of Water Spurting into the Air; from an Aviator's Viewpoint the Battle Scene Is Spread Out Far over a Placid Sea, with Every Ship in View and the Course of Each Shell Made Plain; Even the Submarines Slipping Along Far below the Surface Can Be Seen from the Airplanes



Above Is the Sound Apparatus Used to Teach Sailors How to Locate the Enemy's Position by His Propeller Noises; at Right Submarines Are Filling Their Tanks, and Below Are the Sound Detectors on Duty

surface of the sea, a flight of aircraft was observed far on the starboard bow. Immediately, it was pursued by the American planes, several of which dropped smoke pots and threw streamers of chemical fog between the enemy and the submarines.

Explosions also disturbed the surface of the sea, but the reports, received through submarine microphones by the fleet flagship, declared that the enemy was steadily retiring.

The American submarines never came to the surface, preferring to fight submerged and microphone their reports to the commanding admiral. Their duty was simply to prevent any approach by enemy submarine forces, while the aircraft performed a similar duty in the air.

At length, every submarine ordered to assist in the surface attack had been loaded with its tank.

"Comdesrons [commander destroyer squadrons] detach two squadrons to escort advance of submarines," signaled the flagship.

"Comsubrons [commander submarine squadrons] detach two squadrons to escort submerged advance of submarines surface."

"Cruiser and battleship squadrons follow flagship in initial stages and await further orders stop begin firing as flagship hoists three-quarter speed cone."

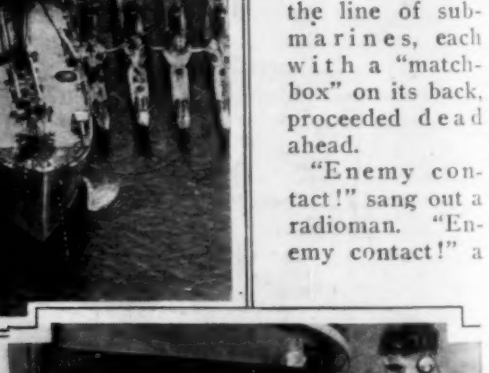
"Turn pennant nine."

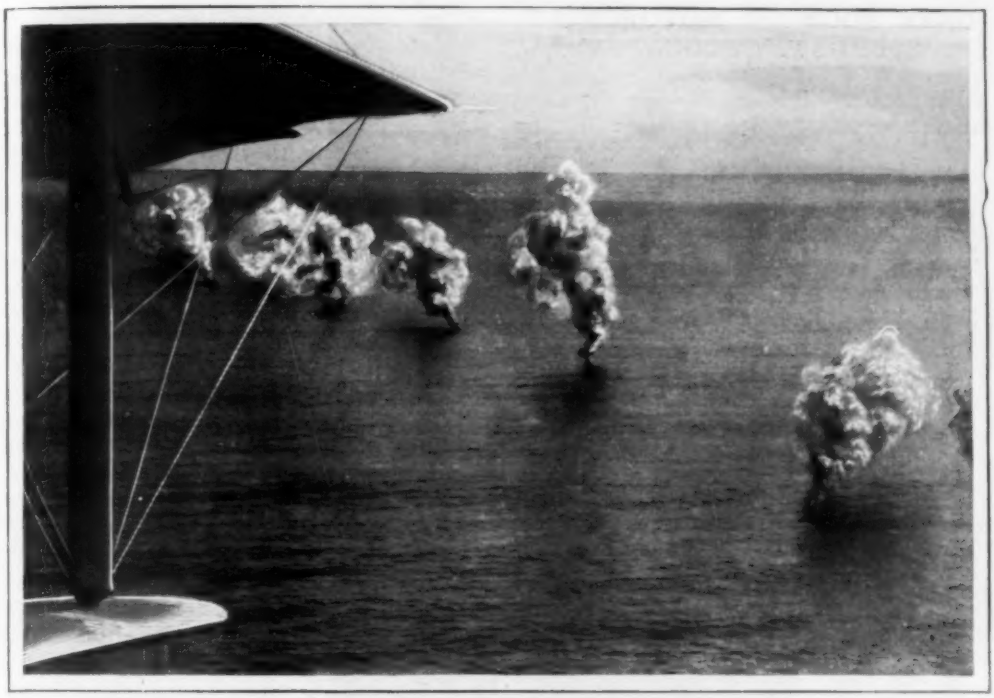
"Execute."

All ships made an abrupt turn to port of ninety degrees, and continued on the course. The same identical turn was made under water by the submarines and in the air by the aircraft.

Majestically, through the smoke still hanging low on the water's surface, the line of submarines, each with a "matchbox" on its back, proceeded dead ahead.

"Enemy contact!" sang out a radioman. "Enemy contact!" a





The Aerial Smoke Screen Goes into Action; the Flyers Can Drop Their Smoke Bombs Far Ahead of the Fleet and Spread a Protective Veil to Mask the Advance of the Surface Craft

quartermaster echoed to his bridge officer, who reported to the admiral. All ships began zigzagging, to throw off enemy gunners, and started firing. Long streamers of smoke fell about the fleet. Meanwhile, the American air forces were keeping the enemy aircraft away, while reporting the targets—"spotting."

The tank-loaded submarines, running on the surface with Diesel engines working at full speed, advanced steadily toward the distant coast, keeping well within the protecting smoke screen laid down by destroyers and aircraft. When there was barely enough water under the keels to permit them to submerge slightly, the squadron adjusted diving vanes and slipped beneath the sea. The ungainly tanks resting on their decks floated off and, on the instant, started their engines. With hardly a pause, the group of steel pillboxes, each carrying its armament of one-pounders and machine guns, proceeded to the distant beach.

A hundred yards off shore, the rapidly shelving sands came up and met them. Marine propellers ceased turning, caterpillar treads were thrown into gear, and the ungainly steel forts lumbered up and out of the water, to sweep the waiting forces with a devastating fire. A new element in maritime warfare had been born —the amphibious tank.

Under cover of the attack, which swept up to the hidden gun pits inland, the battle fleet moved into position and began throwing shells high overhead, to wipe out the gun positions in the rear. Troop ships swung into place and dropped big motorboats. Landing parties piled aboard and followed the course of the tanks to the beach.

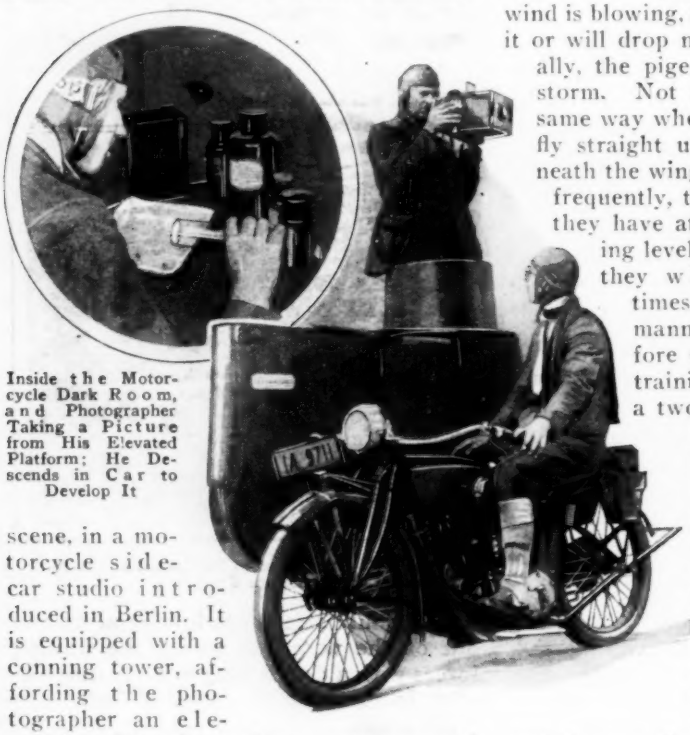
Led by the tanks ashore, the marine regiments, supported by their field guns, quickly consolidated positions and prepared a trench line to hold the beach. The objective had been taken and the war-game maneuvers were ended.

NEW SUBSTITUTE FOR COCAINE

Synthetic cocaine that can be used as a local anæsthetic is reported from Germany. It is said to be a by-product from some of the intermediate substances used in the manufacture of artificial rubber.

DARK ROOM ON MOTORCYCLE SPEEDS PHOTOGRAPHY

Pictures are developed, while the cameramen return to their office from the scene, in a motorcycle sidecar studio introduced in Berlin. It is equipped with a conning tower, affording the photographer an elevated position for making exposures, and inside is a dark room with the necessary chemicals and accessories for developing the plates.



Inside the Motorcycle Dark Room, and Photographer Taking a Picture from His Elevated Platform; He Descends in Car to Develop It

SCHOOL FOR HOMING PIGEONS TRAINS THEM FOR WAR

Over 300 pigeons are enrolled in Uncle Sam's training school on the outskirts of Washington, D. C., where the birds are taught, with the aid of airplanes, how to develop speed and endurance, that they may be useful in carrying messages great distances. The course is carefully planned and the "pupils" are graded according to experience. The beginners in the two-year training period are known as "youngsters," and second-year birds are called "yearlings," while, after that, they boast the dignity of "old birds." The goal set for the pigeons is a speed of more than a mile a minute and an endurance of 500 miles. With a trainer, they are taken high in an airplane, tossed clear of the propeller and allowed to work their way back to the home roost. Some are dropped from an altitude of 10,000 feet. If a strong head wind is blowing, they will try to rise above it or will drop nearer the earth. Generally, the pigeon wins out against the storm. Not all the birds act in the same way when tossed out. Some will fly straight up, others will dodge beneath the wings of the plane and, more frequently, they will drop down until they have attained their favorite flying level of about 500 feet. Then they will circle about several times, and, in some mysterious manner, gain their bearings before starting homeward. The training progresses gradually, a two-mile schedule being the first task. This is pushed up to four miles and finally the pilot takes the candidate twenty-five miles from home with the expectation that the bird will arrive not long after his own return. After this accomplishment, the pigeon is advanced by stages to flights of fifty and seventy-five miles and longer distances until it has completed a trip of 500 miles at the speed desired. The birds are assigned to various lofts according to their accomplishments. About 150 have flown the full 500 miles between daybreak and nightfall, the only period of the day when the pigeons will fly. Several have made the distance five and six times. The training school is conducted under the supervision of Chief Quartermaster Henry Kubec, U. S. N. Having watched the birds very closely, he says that, as a general rule, the pigeons return home by the easiest route.

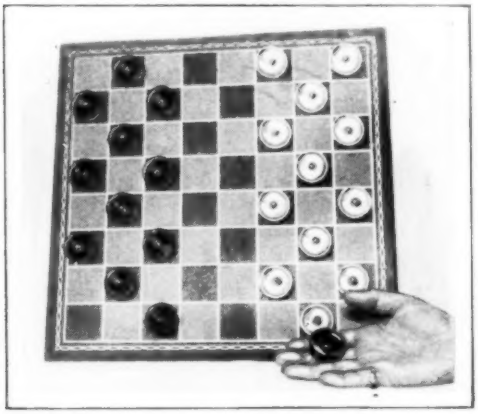
WATER CONTROLS HARDNESS OF CONCRETE

Putting an extra gallon of water into a one-bag batch of concrete is about equivalent to taking out of the mixture fifteen pounds of cement and throwing it away, according to an associate of the American

society for testing materials. By regulating the amount of water, a more water-tight concrete can be prepared than if too much or too little water is used. Wearing qualities of the concrete are also largely dependent upon the quantity of water in the mixture. This refutes the common idea that the strength of concrete depends chiefly upon the amount of cement it contains. On the contrary, the cheapest ingredient is the one that controls the strength of the material. A sloppy mixture will be only about half as strong as one with one-fourth less water and the same amount of solids.

MAGNET CHECKERS HOLD TO BOARD

Accidental shaking of the checkerboard often seriously disturbs a game, but this is not likely to occur with a magnetized set. The pieces have a curved bit of metal on the underside and cling tightly to the board, which is of thin steel. When removed, they are placed on a square of metal in the box.



Magnetized Checkers Stick to Steel Board

Chicago's State Street Gleaming with New Lights; One of the Old Lamps Is Visible near Second Flagpole at Right

NEWEST STREET LIGHTS TURN NIGHT INTO DAY

Special lamps and a type of support post in two sections, that can be taken apart to simplify inspection of the cables within, are features of the new lighting system in Chicago's State street, now one of the most brilliantly illuminated thoroughfares in the world. The globes stand erect instead of being suspended, a position intended to reduce burn-outs to a minimum. Each is sixteen and one-half inches long and six and one-half inches wide, said to be the largest ever used for street lighting. The standards also support the trolley-car wires, eliminating unsightly poles. The system consists of 140 lamps each of 2,000 watts, and cost about $100,000.

¶To every 220 persons in Canada there is one mile of railway.

LORGNETTES FOR ARMY MEN AID IN READING MAPS

Raising His "Lorgnette," the Army Officer Obtains a Stereoscopic View of Map

To enable army engineer officers to read aerial and other maps more quickly, a stereoscopic instrument resembling a lorgnette has been introduced. It magnifies and reproduces perspectives, is compact and flat and easily carried in the kit.

TINY PLANTS FINER THAN DUST SUPPORT SEA LIFE

Too small to be seen by the unaided eye, the diatoms, minute plants of the sea, are regarded as vitally important even to man, for they constitute the basic food supply of many forms of life. The stomach of a young fish revealed the interdependence of the sea's creatures, a curious cycle that leads back to these tiny diatoms. The organ was filled with small herring, these, in turn, were gorged with water fleas and the fleas were full of diatoms. During the past ten years, Dr. Albert Mann, of the National Museum, has been studying these small plants, the grass of the sea, and has prepared an interesting collection of them for the Smithsonian Institution. About 8,000 different kinds already are known. They assume marvelous geometric patterns and have the faculty of transforming within themselves inorganic matter into food. Occasionally, as many as 35,000 will be found in a quart of water. In handling the specimens, Dr. Mann has developed a glass-needle attachment to a microscope so that he can isolate single specimens on separate slides. Fossilized diatoms have been discovered in various parts of the globe where they were deposited on old sea floors. In California, such a deposit is twelve miles square and 1,400 feet deep. The earth is mined and used as a polish and combined with nitroglycerine to make dynamite. It is also serviceable as a filter.

MODEL HOUSES OF BLUEPRINTS AID HOME BUILDER

Blueprints mean little to the untrained layman considering a new home and, to make them more expressive, a young Minnesota woman has devised a way of fashioning models from the prints so that all the dimensions represented will be clearly visualized. The models are made in two types, one closed to show the exterior and the other arranged to be opened so that the floor plans may be revealed. The roof of this kind is lifted off, like a cover from a box, and, if desired, model

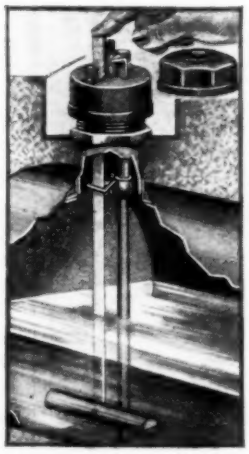
Blueprints Fitted into Three-Dimension Model of House

furniture may be set about to afford an accurate picture of the rooms as they will look when finished.

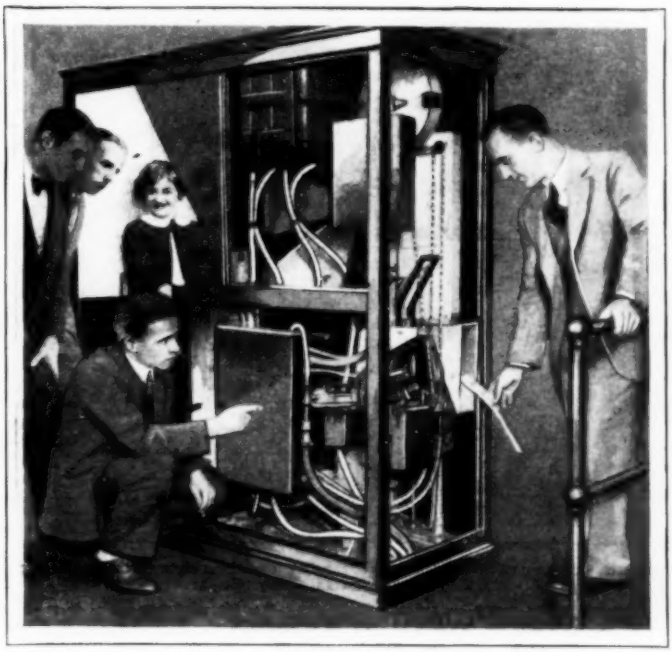
RAILWAY TRACKS THAT TRAVEL

An interesting fact of railway operation is the "creeping" of rails. One of the most remarkable instances of this is found on a line in New Jersey where the road runs over three miles of wet, spongy meadows. When a train passed the whole track sank under it. The effect was the same as if the train were going upgrade, and this caused it to push not only the rails, but the entire track before it. About sixty per cent of the traffic was eastward. It crept as much as thirteen feet in a single week. By means of heavier rails and longer ties, the movement of the track almost has been stopped.

TRIGGER GAUGE FOR GAS TANKS REDUCES FIRE HAZARD



Contents of gasoline or other tanks is quickly indicated to within one gallon by means of a triangular floating rod gauge that rests inside the tank when not wanted and springs into view by pressing a trigger release. The float buoys it up and the reading is taken from the graduations on the rod. It is easy to install and reduces fire hazard, as only the cap to the tank need be disturbed to take a measurement.

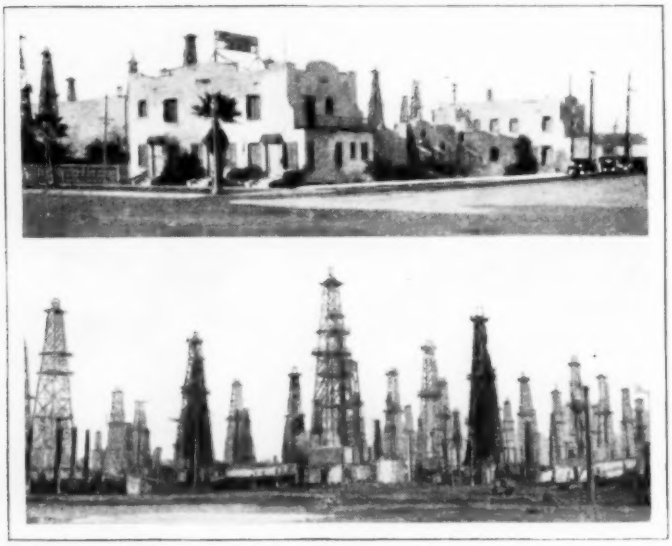


© Herbert Photos

Panels Removed from Slot-Machine Camera to Expose Interior; Coin Aperture at Side and Film Delivery at Right

SLOT-MACHINE CAMERA TAKES EIGHT PICTURES AT ONCE

Eight photographs at one sitting, in the same or different poses, are taken for a quarter by a coin-in-the-slot camera recently introduced. The exposures are made directly on sensitized paper and a positive picture produced by a special chemical process. All eight are made and finished for delivery in as many minutes, and are said to be so clear that enlargements can be taken from them. A feature of the outfit is the temperature-control apparatus regulated by a thermostat for keeping the developing fluids at a nearly even point for efficient results. Since so many different poses can be taken in so short a time at such slight expense, it has been suggested that the camera may be of aid in making the identification photographs of criminals, and of messengers and other employes of banks and brokerage houses. Thousands of persons patronized the machine during the first five days it was exhibited on Broadway in New York. The majority of the patrons, it was observed, were men—a rather unexpected development.



Glimpses of the Derrick "Army" Advancing on Huntington Beach, Calif.; A New Town Site Is Being Sought

OIL WELLS TO OUST HOMES AND MOVE TOWN

Encroaching oil-well derricks at Huntington Beach, Calif., already are within two blocks of the center of the town, and since most of the residents favor drilling in all sections of the community, a committee has been appointed to seek a new location for stores and houses. The rigs, in many cases, stand so close that it would be possible for a man to jump from one to another. Steel derricks are used to avoid fires.

MEANINGS OF AUTO TERMS

It is interesting to note that "chauffeurs" was the term applied to a band of brigands in France. These men seized travelers, carried them into captivity, and burned their feet in order to compel them to tell the hiding place of their money. Gradually, the name came to be applied to men in charge of furnaces or boilers. Then, particularly by way of ridicule, the term became exclusively applied to the drivers of automobiles. Tonneau in French means "barrel." The back portion of the early automobile was round in shape and hence the name. Limousin was the name of an ancient province of France, wherein a designer of clothing turned out a kind of cloak that was taken up and worn by the inhabitants. The name was later applied to the covering of a carriage, and finally to the inclosed motor-car body. Chassis originally meant merely the framework of a wagon. The poppet valve is a name assigned to the English.

PUFFBALL'S EXPLOSION SHOWS NATURE'S SKILL AS SOWER

Photograph of Puffball at the Moment It Burst

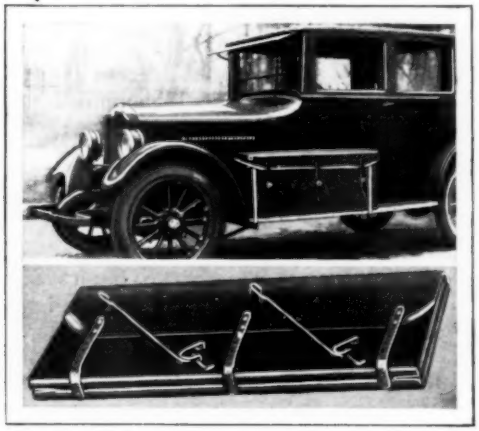
How nature figuratively turns magician to effect the distribution of certain kinds of plants and other growths is illustrated in the case of the puffball, a variety of fungus. When the spores are ready for scattering, the ball bursts, not unlike a small volcano, as shown in the accompanying photograph, and the dust is carried to a considerable distance by the winds. A slight blow is sufficient to cause the "eruption" at the proper season.

TIME YOU CAN HOLD BREATH INDEX OF HEALTH

Sit still for five minutes, breathing normally, then take a deep breath. If you can hold it for forty-five seconds you have good vitality. Fair strength is indicated if you give up even at the end of twenty-five seconds, but if you can hold your breath no longer than fifteen seconds, surgeons would probably consider it inadvisable to operate upon you for fear of fatal result. The test, physicians hold, is an index of a person's power of recuperation and shows, to a degree at least, what reaction would follow the administration of an anæsthetic. Blood-pressure and red-corpuscle tests are also given to determine a patient's condition before an operation. The breath-holding experiment is a result of the war. Aviators who could not endure forty-five seconds were rejected by British and Canadian armies. The person who undergoes an operation is said to experience about the same bodily reaction as an aviator at a height of five miles.

AUTO TRUNK FITS UNDER SEAT WHEN FOLDED UP

Carried on the running board when in use, and fitting under the front seat when collapsed, a handy trunk for the automobile has space for traveling bags, extra blankets, cooking utensils, and other articles. Its cover is of waterproof material. Boards inside keep it in shape and knock down when the trunk is to be put away.



Auto Trunk in Service Position, and Folded Flat to Fit under Seat

New Fire-Alarm Box in Berlin, with Telephone to Nearest Engine House

BOX FOR FIRE ALARM RATTLES IF TAMPERED WITH

False alarms are less likely to be turned in from a signal box introduced in Berlin, for the mechanism rattles instead of sending a call for the fire engines if tampered with. The box is lighted at night, is equipped with a telephone and also registers disturbances on the line, which may be cleared by adjusting a lever.

SNAKES AND ANIMALS IN INDIA KILL THOUSANDS YEARLY

More than 18,000 persons died from snake bites in India last year, according to official reports, while attacks from wild beasts caused 1,974 deaths. Of these, tigers were responsible for nearly 1,000 and the rest were assigned to wolves, bears, leopards, elephants, wild pigs, crocodiles and hyenas.

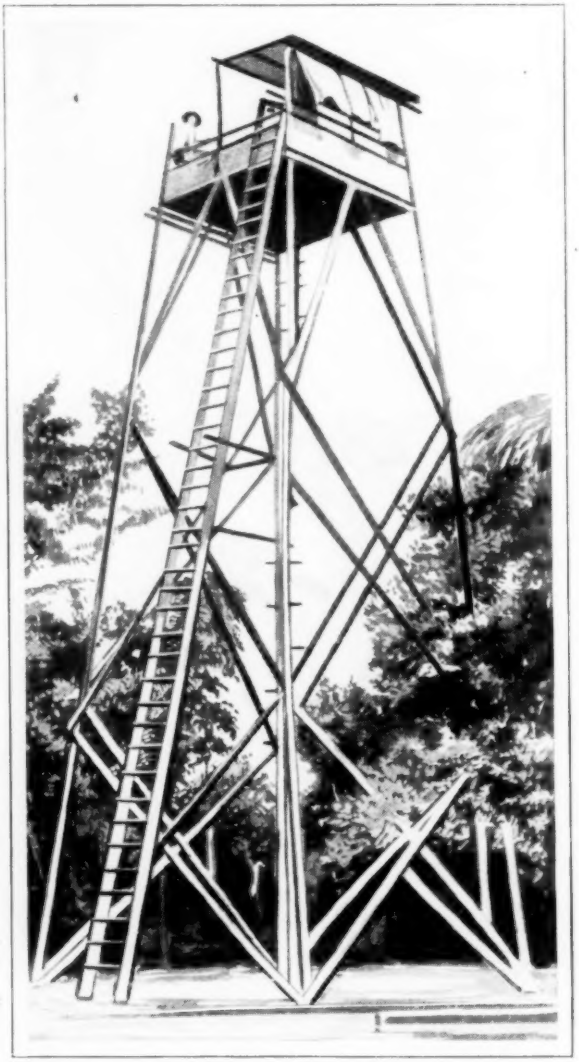
Butterflies from the Cannibal Country Are Turned into Jewelry

By HAROLD T. WILKINS

IT is a long way from the fashionable shops of London to the wilds of New Guinea, from which come the beautifully colored butterfly wings now being fashioned into exquisite jewelry. A single sample of the rare Paradise butterfly, tailed and with wings of black, green and satiny gold, is valued at from $150 to $200.

In the uplands of New Guinea, the climate is cold, while the plains burn in torrid heat. The butterflies fly very high, and one species can be caught only by fixing a dead specimen on a leaf in the sun with wings outspread. The insects fly down to it, just as parrots do to a wounded mate. Acetylene flares are hooked on branches in the mountain country to lure other butterflies after dark, and they are also attracted by great bonfires made in the forests. Native Papuans and the cannibals of the Solomon islands are known to catch them in nets made of a web which trapped spiders will spin around sticks.

At the mouth of the Amazon river, stands a tower carrying a platform just beyond the tree tops. It is a moth and butterfly station where these insects are caught for the leading museums. At night a powerful electric light attracts them and soon they literally envelop the platform in a fluttering cloud tinged with every color of the rainbow.



Butterfly-Trapping Tower Station at Mouth of Amazon River; at Night, Electric Light on Platform Lures the Insects

At an altitude of 2900 feet, an English collector and naturalist, H. S. Landor, saw a vast number of splendid butterflies, one of which followed him for some days, attracted by the scent of some toilet soap.

Gold miners and ore prospectors vary the monotony of digging by exploring the woods around their claims, on the hunt for gorgeous butterflies. Wood cutters and "balata bleeders," roaming hundreds of miles in the

Designs Done with Butterfly Wings; the One at Left Is a Picture to Illustrate a Fairy Story, and at Right, a Locket; the Natural Bright Colors Are Carefully Blended

Imitating Stained Glass with Fragments of Butterfly Wings for a Novel Picture; Nearly 1,800 Wings Were Required; the Artist Is Placing the Tiny Pieces in the Window "Frame" to Complete an Elaborate Pattern; Little Painting Need Be Done on These Pictures but They Are Costly; a Single Rare Butterfly May Cost $200

To Complete the Crinoline-Girl Design at Left, 120 Wings Were Fitted; in the Costume of the Persian Maiden, Right, Veins of the Wings Represent Folds of the Cloth; Butterflies from Equatorial Regions Were Used

Center Photo © Atlantic & Pacific; Sketches Courtesy Thos. L. Mott

vast forests of Guiana to tap the juice of the balata gum, collect butterflies for museums, private collectors and jewelers.

The uses of the butterfly's wings in art and industry will surprise many. The skillful jeweler can incorporate the lovely wings into rings and necklets, and in dainty brushes, mirrors and combs. A few months ago, an English artist exhibited a picture of Catherine of Aragon looking through a cathedral window. All the colors of the rainbow illumine this window, which is about five feet square, and is composed of 1,800 tropical butterfly wings.

Photograph of High-Voltage Charge of Electricity as It Registered through Quartz Lens

PHOTO OF ELECTRIC SHOWER TAKEN WITH QUARTZ LENS

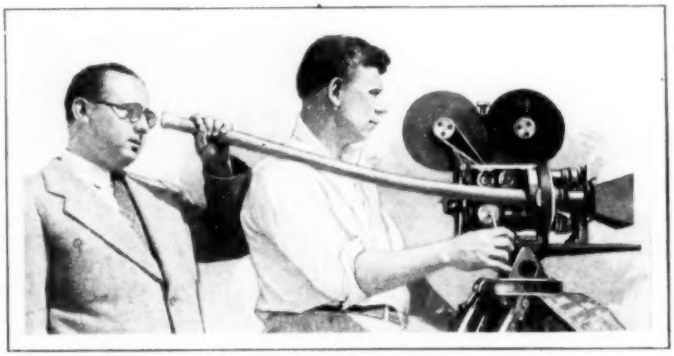
How a shower of electricity would look was pictured recently when a camera with a special quartz lens was exposed to ten consecutive tests of special high-voltage transformer equipment in an eastern testing laboratory. A pressure of 850,000 volts was used, and, while this was not sufficient to cause a spark to flash over the gap in the equipment, it was great enough to set up an electrostatic field which, after repeated exposures, the rapid quartz lens was able to record on the plate.

HOW SCIENCE AIDS INDUSTRY

How the chemist, with his test tubes and other laboratory apparatus, is influencing the development of industry is one of the romances of modern times. Artificial silk, a synthetic product, is becoming increasingly popular and its manufacture already constitutes an important economic factor in this and other countries. On the heels of this discovery comes the report that the scientists are approaching a method for the making of artificial wool. Processes have been developed for the fixation of atmospheric nitrogen with the result that products for fertilizing the soil can be obtained more cheaply. Another invention that is being applied to industry with important results, is the low-temperature carbonization of coal.

PEEP TUBE ON MOVIE CAMERA TO IMPROVE FILMS

Through a flexible tube attached to the motion-picture camera, the director is able to see the view as it will appear on the screen without interfering with the photographer. It is believed that this arrangement will reduce the retaking of film because of mistakes, as the director can instruct the players more effectively.



Director Inspecting View Before Film Is Taken; Flexible Tube Permits Criticism of Scene as Audience Will See It

WONDER STORY OF SILK FROM WORMS TO FABRIC

A Few Scenes from the Eventful History of Silk in the Making

Feeding Mulberry Leaves to Silkworms; Picking Cocoons from Straw, Center; Reeling Fiber, Loading Silk from Steamer and Weighing Finished Article

Interesting steps mark the history of silk from the worm to the finished fabric. Japanese girls feed mulberry leaves to the worms, and the cocoons are carefully protected and placed in warm water when the silk filament is ready for removal. This simplifies the process of reeling the fiber into skeins of raw silk for shipment. Ocean liners, bearing the product from abroad, are met by fast trains which speed the consignments to the manufacturing plants in all possible haste to reduce expenditures for insurance and other costs. Cultivated for more than 4,000 years, the silkworm at times has been the victim of various diseases. In searching for a remedy for one of their maladies, Pasteur, the great French scientist, made some of his most important discoveries, though his rabies treatment has overshadowed them.

WHY WE "SEE" STARS

Stimulation of one of the nerves by a blow on the head is said to account for the common experience of "seeing stars" after a severe bump. This nerve carries the shock to the brain which interprets it as light, and when artificial stimulation is produced, as from a blow, the impression of a flashing light in the form of moving "stars" is conveyed to the brain.

WEATHER MAPS SENT BY RADIO PROTECT NAVIGATION

Copyright, Harris & Ewing

C. Francis Jenkins with Unit of Radio Apparatus for Transmission of Weather Maps; Copy on Cylinder Instead of Flat Surface

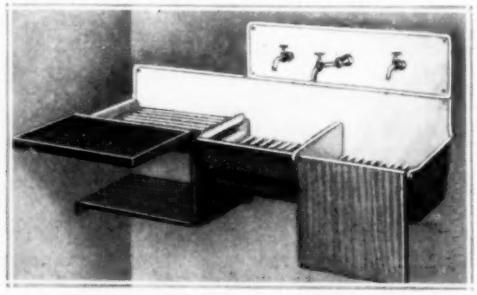
Radio has reached out into the sea to further aid man in a process for transmitting to ships weather maps complete with high and low-pressure lines and other marks. Several vessels of the navy department already have been equipped with "radio-vision" outfits for receiving the charts. The method is an adaptation of that invented by C. Francis Jenkins for sending and recording photographs and moving objects by wireless. In the first tests, a 20,000-volt radio-telegraph transmitter at the naval radio station at Arlington, Va., sent the maps to ships cruising along the Atlantic coast. A photographic film of the chart, either a positive or a negative, was wrapped around a glass cylinder from the interior of which, as it rotated, a light shone upon a photoelectric cell. The lines on the map interrupted the light, thus changing the values for broadcasting purposes. The impulses were picked up on an ordinary radio receiving set. Its output was made to control a "blocked" electron tube in such a way that a "radio pen" traced the lines of the map on a piece of paper wrapped about a cylinder.

LONG-DISTANCE PHONE BASED ON "BOOSTER" TUBES

Telephoning distances of 4,000 and 5,000 miles with ease and clarity is now an everyday occurrence, but few patrons realize what efficient aids have been summoned to help carry their voices so far. The function of these unseen servants is to magnify the voice at various points along the line. For instance, on the toll circuit between New York and Chicago, there are sixteen such "booster" or repeater units. They build up the energy of the voice which ordinarily would be lost or greatly diminished in traveling over the closely spaced wires of the cable. Each of these stations is said to amplify the voice energy 200 times. The amount of energy handled is extremely small. It has been estimated that if conversation was carried on continuously for a period of ten years between the two cities, the accumulated energy received by one of these repeaters would be about sufficient to light a fifty-watt lamp for only one minute. But one large repeater cannot be used, engineers say, because it would require more energy than the total amount of known energy in the world.

SINK FOR SMALL APARTMENTS REDUCES BREAKAGE

Drainboard and sink are both equipped with a wooden latticework to reduce the likelihood of breaking dishes while covers



Compact Sink for Small Apartments; Wooden Bottoms Reduce Breakage and Shelves Afford Storage

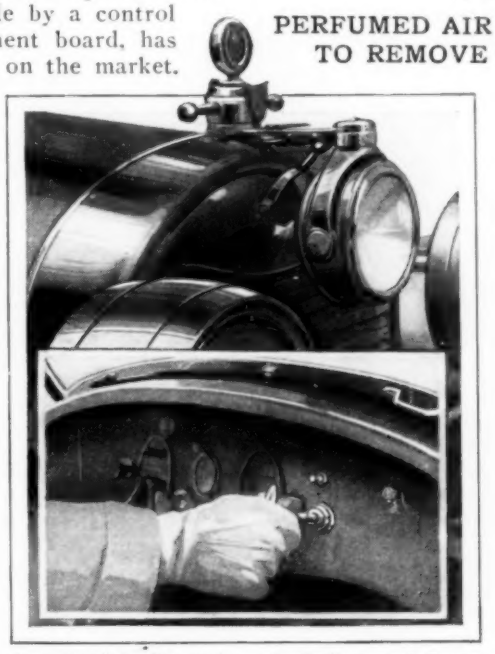
are provided to conceal the basin and drainboard and afford extra shelf space for small apartments. The sink is of German design and is divided into two sections, for hot and cold water.

INVISIBLE BLACK-LIGHT RAYS TO TRAP BURGLARS

A new use for the invisible light rays at either end of the spectrum, the ultra-violet at one end and infrared rays at the other, is being tried out in laboratories, and offers a possible solution for the burglar-alarm question. The big drawback to present electrical-alarm systems is that the burglar may find the wires and discover methods of circumventing them. With the invisible light-ray alarm, the possibility of detection is removed. A light producing the invisible rays is placed at one side of the door, window or corridor to be protected, and on the other side is a photoelectric cell, connected to the alarm system in such a way that as long as the rays continue to strike it the alarm bell remains silent. As soon as a marauder passes between light source and electric cell, however, his shadow cuts off the flow, and releases the alarm.

SPOTLIGHT ON RADIATOR IS OPERATED FROM DASH

A spotlight mounted on the radiator of an automobile, but moved up and down and from side to side by a control lever on the instrument board, has recently been placed on the market. A flexible-cable connection terminates in a small lever on the dash, which is moved from side to side for both horizontal and vertical movements, being pushed in for the one and pulled out for the other. Another fitting, which is offered as a substitute, connects to the steering rod and automatically turns the light as the wheel is moved, so that the beam is always thrown in the direction in which the car is turning.



Auto Spotlight Mounted on the Radiator and Swung in All Directions by a Dash Control

Swimmer Wearing Pair of Inflated Rubber Arm Bands; They Serve as Buoys but Do Not Impede Movements

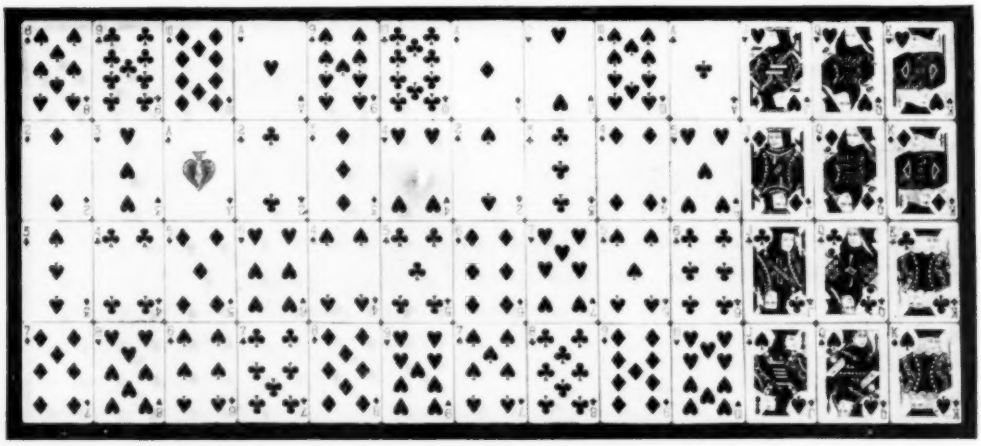
SLEEVE FLOATS FOR SWIMMERS REDUCE DROWNING RISK

Wide rubber arm bands that can be inflated and are kept from collapsing by means of a valve, have been devised for swimmers. They are said to make sinking almost impossible and are especially helpful to beginners who are timid.

PERFUMED AIR FOR HOSPITALS TO REMOVE DRUG ODORS

Substitution of sweet, wholesome scents for the odors of chloroform and disinfectants that sometimes prevail in hospitals has been recommended as an additional way of improving conditions for patients. The use of soft color tints, such as gray, pink and green, already has proved beneficial as compared with monotonous white, and the perfumed ventilation is considered in line with this helpful change in coloring.

MYSTIFYING TRICK LOCATES ANY CARD IN THE DECK



Prepare the Deck According to This Diagram, Then Either Turn the Cards Face Down or Gather Up the Deck by Starting at the Top Left, Keeping Them in the Same Order

A mystifying trick by which any playing card called is instantly located, can be performed with a deck arranged as shown in the illustration. The cards are laid out face downward, however, so that, before trying the trick in public, it is well to practice the trick with the cards face up, until you become familiar with its working. You will note that the three face cards of each suit are together at the right end of the rows. Memorize the order in which the face-card suits appear, hearts at the top, then diamonds, clubs and spades. After that is learned you consider the rows as ten cards each, plus the face cards, which are dealt with separately, as you already know their exact places in the layout.

To locate any other card called for, you multiply the value of the card by four, and, if it is a diamond, club or spade, add three, six or nine, as the case may be, to represent the face cards. If the card called for is a heart you do not add anything, but simply take the product of the card multiplied by four, and count down that number, beginning with the upper left-hand corner, and counting only the rows of ten. For example, if the six of hearts is called for, you multiply six by four, giving twenty-four, and find the card is the fourth from the left end of the third row. If the card was the six of diamonds, you would add three, representing the three diamond face cards, to twenty-four, giving twenty-seven, and the card is the twenty-seventh down. Similarly the six of clubs would be twenty-four plus six and the six of spades twenty-four plus nine, or thirty-three cards down. When the product, plus the added number, is over forty you simply subtract the forty and use the remainder. Thus the ten of clubs gives forty-six—four times ten plus six for the diamond and club face cards. Subtracting forty, you will find the ten-spot is the sixth card in the first row.

Or the trick can be worked backward, by asking for a number and then naming the card. If some one asks you to identify the thirty-second card you know it is a heart because thirty-two can be divided by four, and, by dividing, you get eight, so it is the eight of hearts. If the number given is thirty-three it can not be divided by four, so the card is not a heart. Take off three, representing three face cards, and you have thirty, which likewise can't be divided by four, so it isn't a diamond. Subtract three more, leaving twenty-seven, and as that can't be divided by four it isn't a club. Subtract three more, giving twenty-four, divide that by four and you find the thirty-third card is the six of spades.

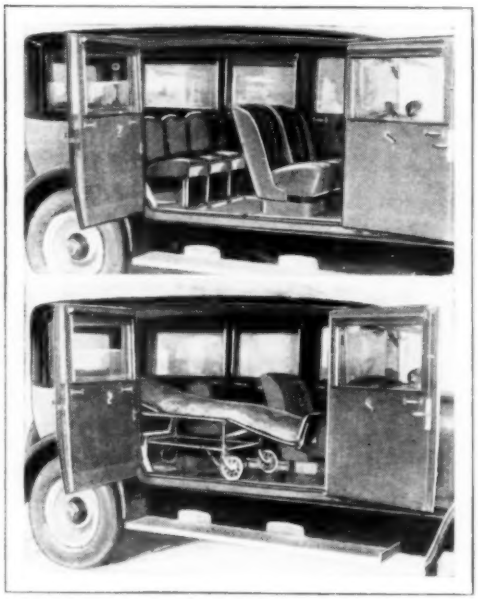
As soon as you have learned the system thoroughly, it isn't necessary to spread the deck out on the table. You can keep it piled, and yet give the location of any card in it.

SUBMARINE LIGHTS TO GUIDE SHIPS AND AIRPLANES

Powerful underwater searchlights, laid in lines to mark the sea routes, have been suggested as a means of safeguarding night travel by vessels, especially through rocky reefs or other dangerous passages. On busy lanes, a "rule of the road" could be established to keep ships going in one direction on one side of the lights and those coming in the opposite direction on the other side. The illumination would be a help in fogs and would also serve as a guide for airplane pilots, as the lamps would be visible at great distances.

SEDAN FOR EIGHT PASSENGERS SERVES AS AMBULANCE

Seats are so arranged in a roomy eight-passenger sedan that some of them may be removed and converted into a stretcher, should it be necessary to use the car as an ambulance. Absence of a partition between the side doors permits removal of the cot, which has wheeled supports. When the car is adapted for passengers, the three single seats which are arranged between the main rear and front seats form the chief feature.



Seats Arranged for Eight Passengers and Adjusted as Wheeled Stretcher; Note Absence of Door Post

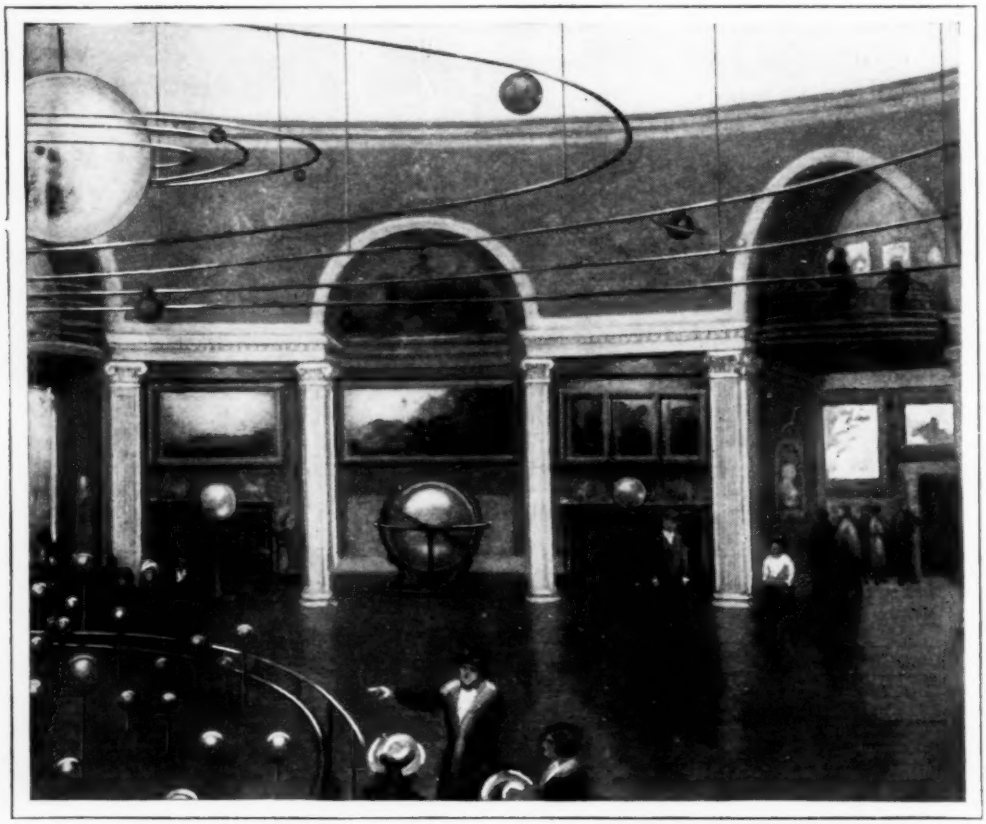
To Perpetuate the Memory of a Servant to Man; Tablet in Honor of John F. Appleby

MEMORIAL STONE TO INVENTOR OF BINDER-TWINE KNOTTER

Near Elkhorn, Wis., a memorial stone has been erected by the state historical society in honor of John F. Appleby, who invented the mechanical twine knotter used on grain binders today. He developed the attachment before enlisting in the Civil war, but did not put it to successful use until several years later, when wire was discarded as a means for tying bundles. He spent much of his time experimenting with the device on the Wisconsin farm where the marker has been raised in his memory.

FIRE ALARM RECORDS FINGERS

Turning in false alarms has become such a sport in Berlin that the fire department has been experimenting with an alarm box which automatically registers the fingerprints of anyone who tampers with the signal. The recording unit is on the knob of the box. According to reports, the plan has succeeded in smaller cities and is expected to be adopted in Berlin.



Miniature Indoor Universe, Planned for Astronomical Hall of the American Museum of Natural History, Will Enable the Layman to See the Sun, Stars and Planets Revolve

To Reveal the Secrets of the Heavens at a Single Glance

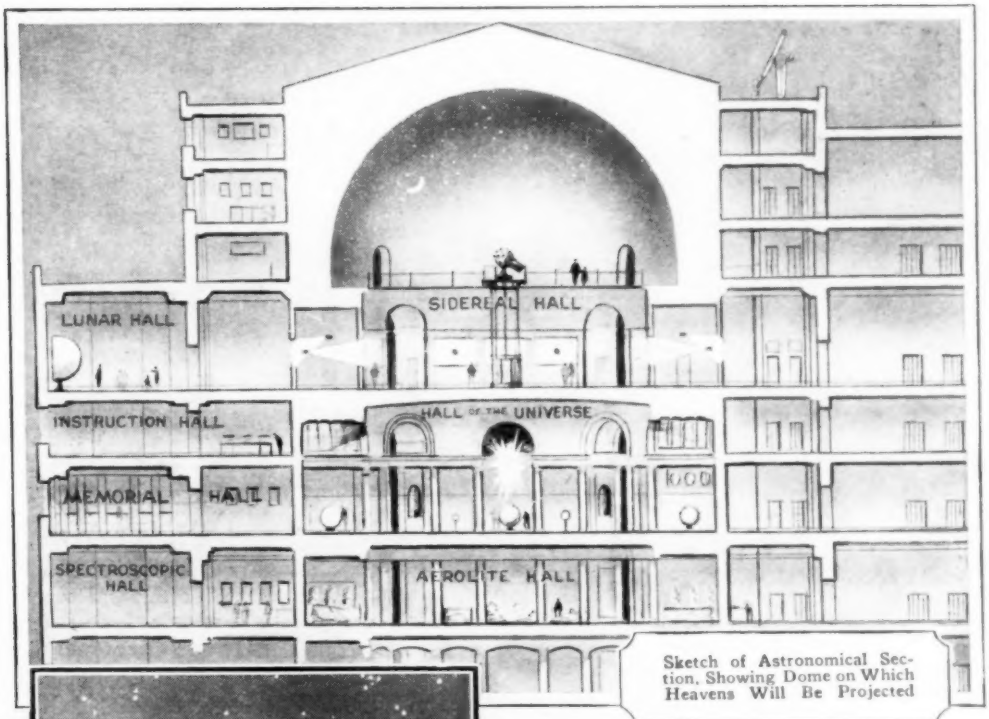
HAVE you ever had a longing, as you gazed at the stars in the heavens on a clear night, to explore the mysteries that seem ever-present yet distant, inviting yet beyond comprehension unless you devoted long hours of study to them?

Imagine, then, an arrangement which would enable you to take in the whole universe at a single glance, an arrangement within the four walls of a museum which showed the relative placing of the sun, earth, moon, stars, and the rest of the planets, all correctly proportioned with respect to each other.

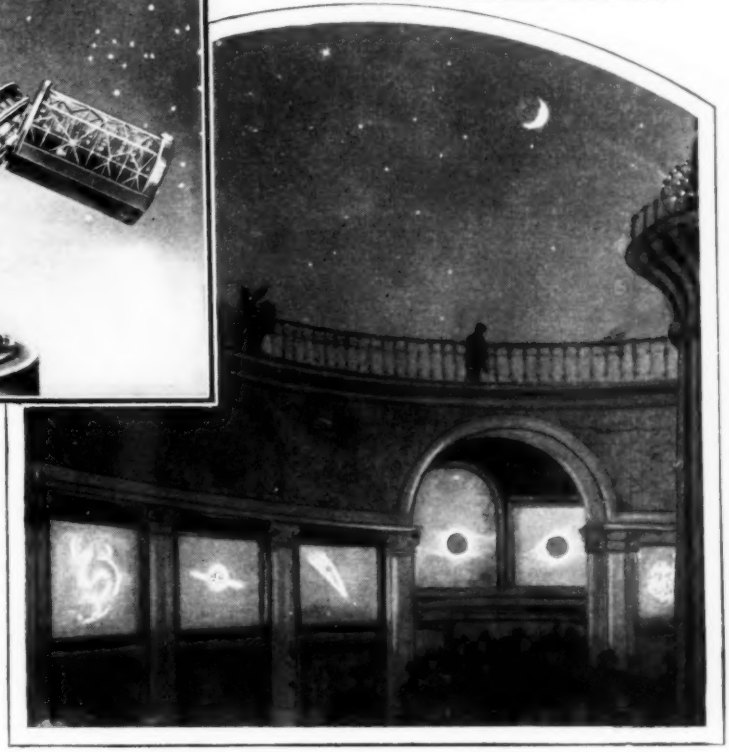
Plans now under consideration by the American Museum of Natural History in New York provide for such a planetarium where, unlike the technical observatory in which the average man feels lost, laymen will have an opportunity to contemplate the array of stars and planets which have taken astronomers centuries to discover and catalog.

There will be a dome with the effect of the stars obtained through the use of a powerful lantern to throw slide pictures made from drawings based on photographs of the heavens. Complete representation will be effected by thirty-one slides closely fitted together.

If the system in vogue at similar so-called Uranias in Europe is adopted, a small telescope will be provided for visitors and a light will shine from the museum when the weather is ideal for star gazing. Popular lectures also may be given



Sketch of Astronomical Section, Showing Dome on Which Heavens Will Be Projected



The Projection Lantern Above, One of the New Triumphs of Lens Making, Will Throw All the Main Features of the Sky on the Dome, as Shown at the Right, So That the Observer Will See the Glowing Stars, Moon and Planets Moving in Their Proper Orbits Overhead, While Lecturers Identify Them and Describe the Story of Their Life in Space

Novel Use of a Collector's Trophies; a Portrait of Hans Lagerlof of Sweden Done Entirely in Stamps

PORTRAIT IN POSTAGE STAMPS RIVALS WORK WITH BRUSH

One of the exhibits at a collector's convention in New York city was a portrait done in bits of American and Swedish stamps. The pieces were arranged by colors in such a way that the features of the subject were realistically reproduced. The background was also made of stamps.

HEROES OF WORLD-WAR BATTLE HONORED BY MONUMENT

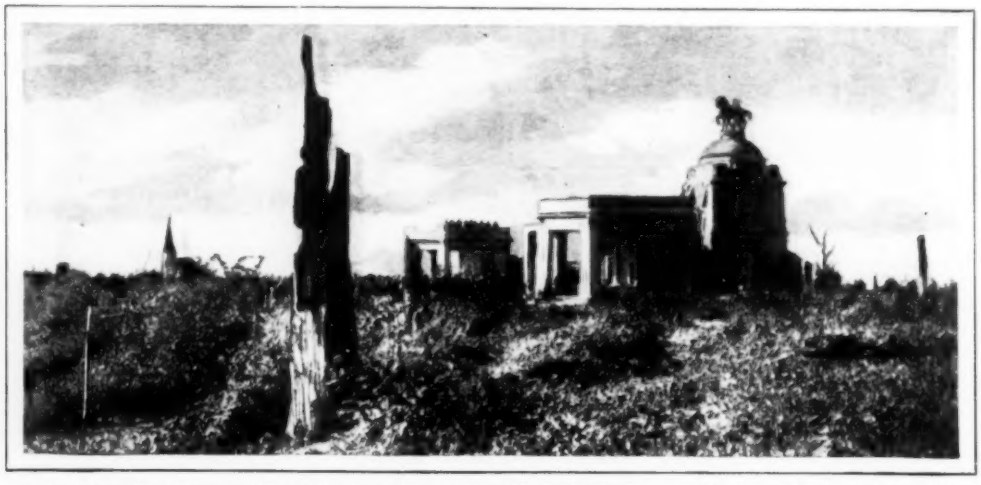
Among the shattered stumps and underbrush of Delville wood, in France, a handsome memorial has been built in honor of allied soldiers who fell in battle there. On that spot was fought one of the most fiercely contested of all the engagements during the main battle of the Somme in the summer and fall of 1916. Troops from South Africa were chief contestants for the allies in the fighting around the wood.

IMITATION OF GOLD IS FOUND IN NEW COPPER ALLOY

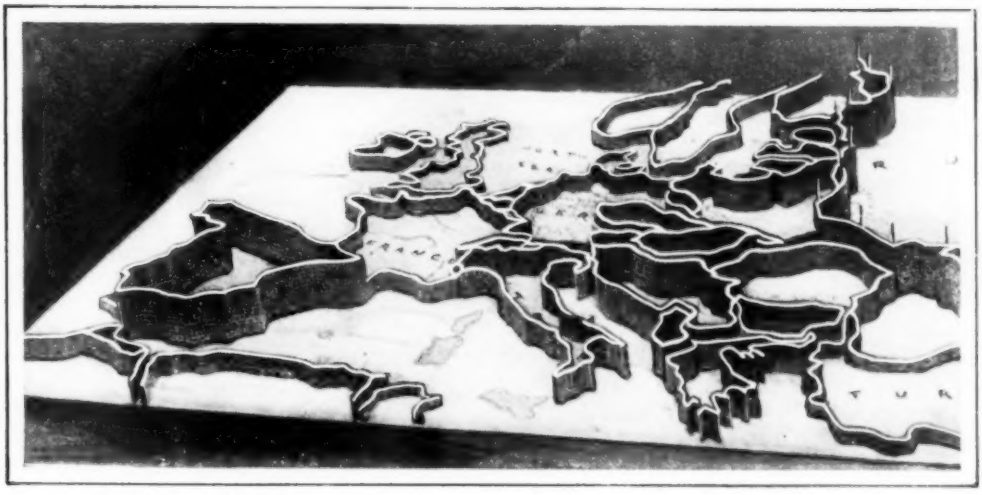
Metal workers are investigating the possibilities of a new alloy of copper and beryllium, discovered recently, as it is believed to present an ideal material to be used as imitation gold. If such a substance has been found, it will have an important effect on the goldplating industry, authorities point out. About five per cent of the alloy is beryllium. A desirable imitation should retain its brightness after long exposure to the air and to the heat of machines where temperatures of 750 degrees Centigrade are encountered.

NINETY THOUSAND LIVES TOLL OF YEAR'S ACCIDENTS

In 1925, the toll of human life taken by the automobile in America was at the rate of over two persons an hour for every day in the year, the total being 22,500, of whom nearly 6,300 were children under fifteen years old. These figures are taken from a report of Dr. Louis I. Dublin to the



Tribute to Fallen Heroes amid the Shattered Stumps of a World-Battle Ground; the Memorial to the Men Who Fought at Delville Wood in France



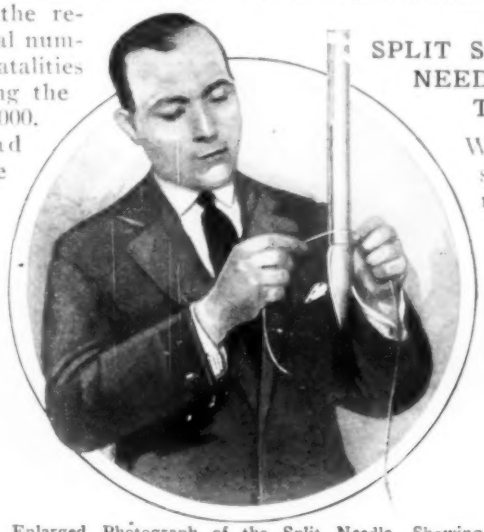
Courtesy Illustrated London News

Tariff Conditions in European Countries at a Glance; Relative Height of Walls on Map Indicates Trade Restrictions in Various Sections; a Wire Barrier Surmounts the Russian Wall

National safety council, and indicate that, whereas the automobile death rates in England and in the United States were about the same in 1911, fatalities from this source now occur about two and one-quarter times as frequently in this country as in England. Government statistics showed that the rate of automobile deaths here was 76.2 per 100,000 population. In England and Wales, over the same period, it was 34.1 per cent. There was a decrease in the number of deaths from accidental falls, burns, drowning, steam-railroad and street-car accidents, the reports showed, the total number of accidental fatalities from all causes during the year being nearly 90,000. A survey of railroad conditions led to the conclusion that employment on the lines is now less than one-third as hazardous as it was twenty years ago and that, during the last thirteen years, employe and passenger fatalities have been reduced nearly sixty per cent—a very creditable showing.

EUROPE'S HIGH TARIFF "WALLS" SHOWN ON MODEL MAP

National boundaries of countries in Europe were marked with walls on a model map to illustrate the comparative tariff restrictions imposed by different nations. The exhibit showed that Great Britain, northern Ireland, Holland and Tunis have the lowest walls, while Russia has the highest. A wire barrier was stretched on top to indicate that trade conditions are difficult under soviet rule.



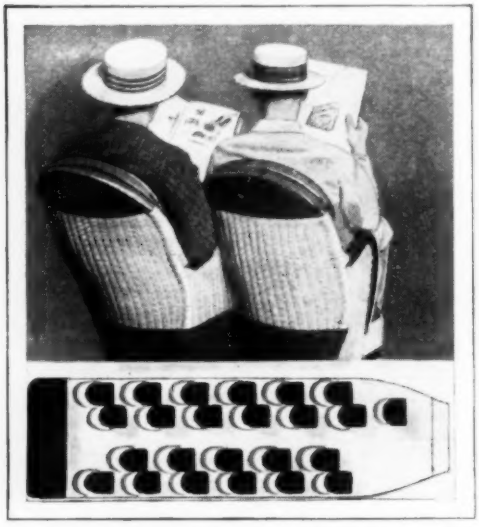
Enlarged Photograph of the Split Needle, Showing How Thread Is Inserted

SPLIT SEWING-MACHINE NEEDLE IS EASILY THREADED

With a fine split on one side a sewing-machine needle is said to be much easier to thread than the ordinary kind, particularly if the operator is hampered by imperfect eyesight. The slit is too small to permit the thread to become dislodged accidentally while sewing and the needle functions as any other.

STAGGERED SEATS IN AUTO BUS AFFORD GREATER COMFORT

Greater ease and more privacy are afforded passengers in auto busses when the

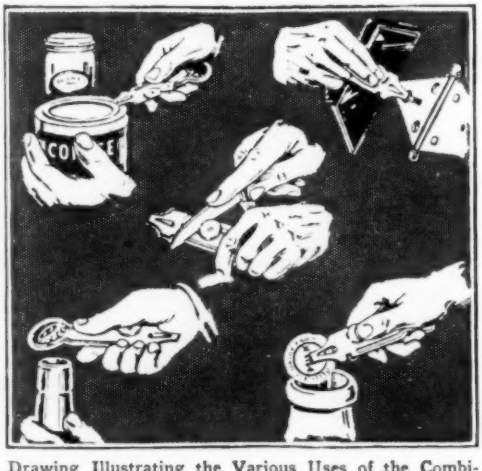


How the Staggered Seats Afford More Room for Passengers and Diagram of Bus Interior

seats are set in staggered fashion so that the shoulders of two persons sitting side by side overlap but do not touch. The arrangement also to some extent increases the width of the aisle.

FIVE TOOLS COMBINED IN ONE TO REDUCE KITCHEN LABOR

Three kinds of openers, a knife sharpener and a screwdriver are combined in a durable, all-metal implement for the kitchen. It removes the caps from milk bottles and the crimped tops of other containers or can be used for prying up the lids of coffee cans and fruit jars. The sharpening unit is attached at the side and work can be done without fastening the tool to a table or bench as is necessary with most devices of this kind.



Drawing Illustrating the Various Uses of the Combination Tool; the Sharpener Shown in the Center

WAY TO SAVE AIRMEN'S EYES SOUGHT BY NAVY

A new type of goggles to protect the eyes of aviators is being sought by the navy. The malady commonly suffered is snow blindness. It has little to do with the snow, since it may be encountered at almost any season and is produced by the reflection of the sun's rays from small particles floating in the air. The trouble is an old one, explorers in ice-bound regions having been bothered with it on many occasions. Only recently when Lieut. Comm. Byrd returned from his expedition to the Arctic, he reported that the sight of his right eye had been impaired during the flight to the pole. Another difficulty when flying at great heights is the unnatural angle from which the rays strike the eyes. According to scientists, men have become accustomed to light reflected from the ground and striking the lower part of the eye. At a great height, more light than usual shines in at the upper part of the retina and, being unaccustomed to this radiance, it becomes temporarily deadened and vision troubles follow. Added to this factor, the airman often must take off or land at morning or evening when he encounters the full light of the sun and has to battle against winds, dust and extreme changes of temperature. The new goggles are to be designed to satisfactorily meet all these conditions. A type already tested is considerably larger than those now in use, and the glasses are bent to follow the contour of the average face. One of the most important problems is to find a glass which will keep out the injurious rays yet not rob colors of their true value.

CHEMISTS TO SEEK WAY OF MAKING PETROLEUM

For many years, chemists have been searching for a way to make synthetic petroleum and now more thorough experiments than have yet been attempted are planned by the American petroleum institute, under an endowment of $500,000 established by John D. Rockefeller. The investigators will attempt to reproduce, as nearly as possible, the geological conditions believed responsible for the formation of petroleum.

SIEVE FOR CEMENT HOLDS WATER

Contrary to an old proverb, it is possible to carry water in a sieve. At least some of the screens used in cement making are so fine that they will hold the liquid as shown in the photo. The sieves are employed in sifting materials for the cement after they have been burned. One test requires that seventy-eight per cent of the powder should pass through a sieve that has 40,000 meshes to the square inch.

Illustrating the Fine Texture of Screen Used in Sifting Cement Materials; Sieve Holds Water

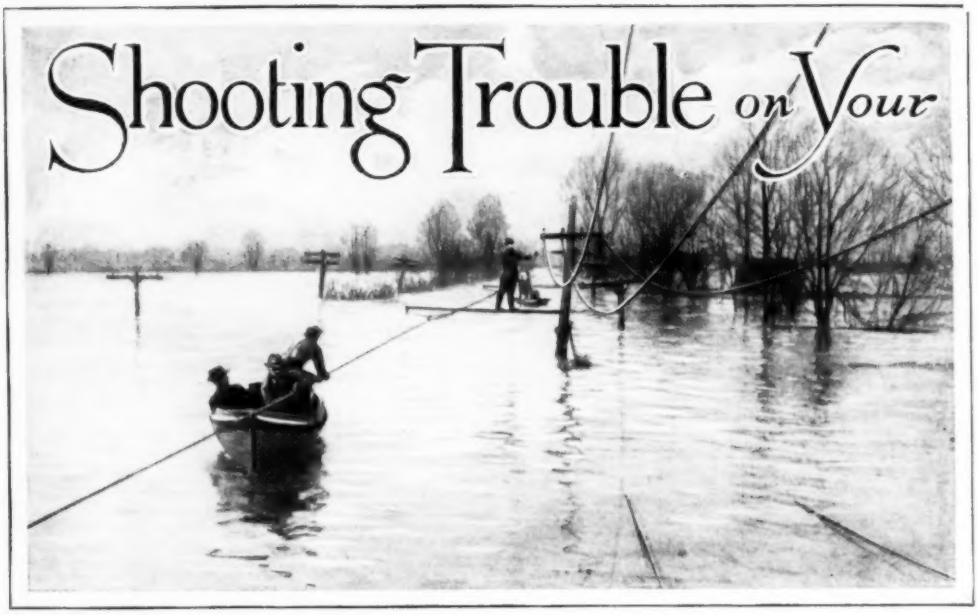
A Promenade for Persons on Each Floor; Sidewalks on Terraced Building in Hamburg, Germany, Afford Light and Fresh Air

SIDEWALKS FOR UPPER FLOORS OF BUILDINGS COMING

In the so-called "stepped-in" style of modern office-building construction, architects see an additional development for city dwellers besides the increase in light. The terraces will permit the installation of separate sidewalks high above the one beside the pavement where workers may promenade during luncheon hours and thus enjoy the benefits of fresh air without riding to the street or ascending to the roof. In Hamburg, Germany, this innovation already has appeared. Curved recesses for the windows suggest the arches along a monastery cloister. The arrangement affords abundant light through office windows, and space that otherwise would be wasted is utilized.

¶ Five or six miles a day is the usual rate of travel for icebergs.

Shooting Trouble on Your



Linemen Using the Street-Car Trolley Wire to Pull Their Boat Along as They Restore Telephone Service While the Flood Waters Still Cover Farms and Houses

A TELEPHONE subscriber in New York is talking to a business friend in San Francisco. Every fifty miles along the line, from coast to coast, a trouble doctor of the telephone company is standing by to watch that the line is kept open, and if anything happens, to see that a new channel of communication is instantly switched into service.

In every telephone office in the land, hidden out of sight in some back room, is the surgery of a trouble man or men—one or two in small offices and a dozen or more in big ones. Out in the country along the long-distance wires are similar doctors, spaced never more than half a mile off from an even fifty miles apart. Sometimes the country-wire doctor's office lands in the village exchange, but just as often it is set down in the middle of a corn field or in a clearing in some mountain woods.

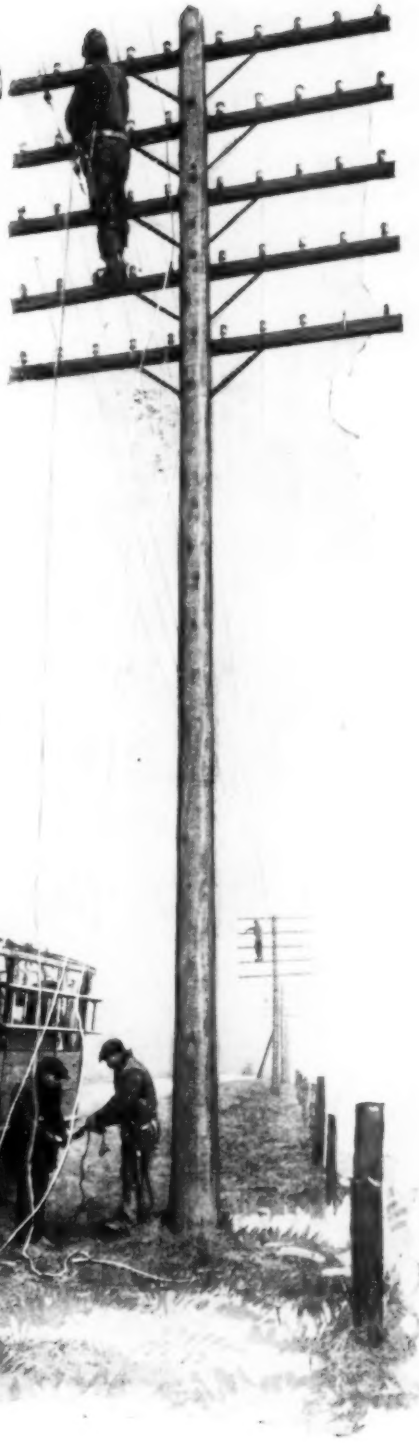
The country trouble shooter has the busiest life, for his patients are usually above ground, strung on poles where they are exposed to gales and sleet storms, to thoughtless hunters with a penchant for inflicting gunshot wound on glass insulators, and to such varied enemies as rats and squirrels.

The city-wire doctor hasn't so many varied diseases to treat, because most of his patients are already buried underground, in lead-sheathed cables carried through tile conduits. Left alone and undisturbed, with all joints properly soldered, trouble cannot develop in an underground telephone cable, but so long as cities grow and change, the conduits are never left alone long.

A new subscriber orders a telephone installed and the nearest manhole must be opened, the lead cable tapped and one of the extra pairs of wires, already installed for just that purpose, tapped and led into the house. With the connection made, short lengths of tubing, resembling radio spaghetti, are slipped over the new joints and the whole collection of cable wires, as many as 2,200 pairs in a big city cable, is bathed with melted paraffin to drive out the moisture and seal the joints with water and air-proof insulation. A big sheath of lead is then slipped over the cut and soldered to the lead cable.

Somewhere in the process a tiny air hole may be left, water seeps in, and sooner or later the trouble doctor, ceaselessly feeling the pulse of his miles of patients with delicate electrical apparatus, detects an

Telephone Line



incipient case of disease that calls for a major surgical operation. A Wheatstone bridge is called into the diagnosis, and by measuring, to an unbelievably delicate degree, the exact resistance of the wire from the office to the scene of trouble, the doctor locates it within a matter of a few feet. The repair crew is dispatched to the scene, the defective joint opened, boiled out again with paraffin, and resealed, the whole operation often being completed before the subscriber even discovers that there is the least trouble on the line.

The streets of a big city are honeycombed with the lines of the various utility companies. Each knows where the other's property lies, and tries to miss it, but doesn't always succeed. A crew from the waterworks or the gas company, laying a new line, tries to save tearing up the pavement by boring a hole across the street beneath the ground. On the opposite side is a telephone conduit, carefully marked on the map, but through a mistake the boring auger is misdirected and drills through a lead-sheathed cable. Another job for the repair crew.

A workman wrecking an old building in Chicago last

Exposed Overhead Wires, Long the Prey of Every Sleet and Wind Storm, Are Fast Being Replaced by Lead-Sheathed Cables

When Snow and Sleet Burden the Wires, the Linemen Must Maintain Constant Patrol

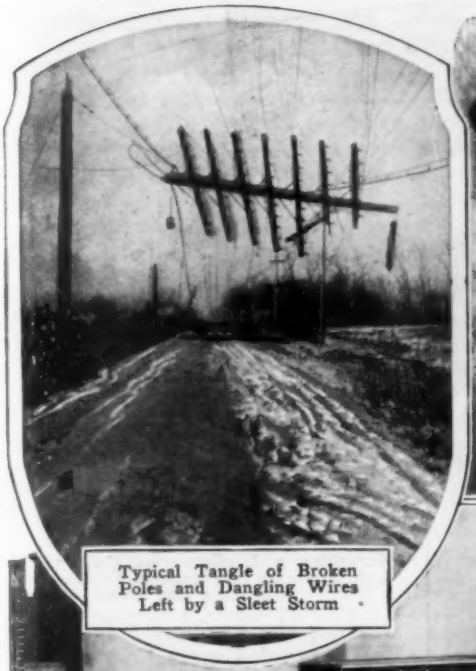
winter struck a pick into some hard object, and, in a blink, 2,000 phones in the business district went out of service. A big job for the repair crew—patching and reinsulating 2,000 pairs of wires.

For the main long-distance lines, cables, suspended from poles, are replacing the individual wires of the past. The worst damage from wind, sleet and other natural causes is thus averted. A sleet storm may drag down hundreds of single wires and put the entire service out of commission, whereas the cable may be pulled down and lie on the ground without interrupting a single conversation.

But the aerial cable has acquired a new list of enemies all its own. Birds perch on it and some thoughtless hunter takes a shot and peppers the cable full of shot, causing a flock of short circuits. At a distance of thirty or forty feet, a shotgun pellet will penetrate the lead sheath and cause considerable damage. Trouble from this one source reached such alarming proportions in one district of southern Illinois a few months ago, that the telephone company was forced to enlist the aid of newspapers in half a dozen adjoining counties to print a general appeal to the public not to shoot birds on the phone wires.

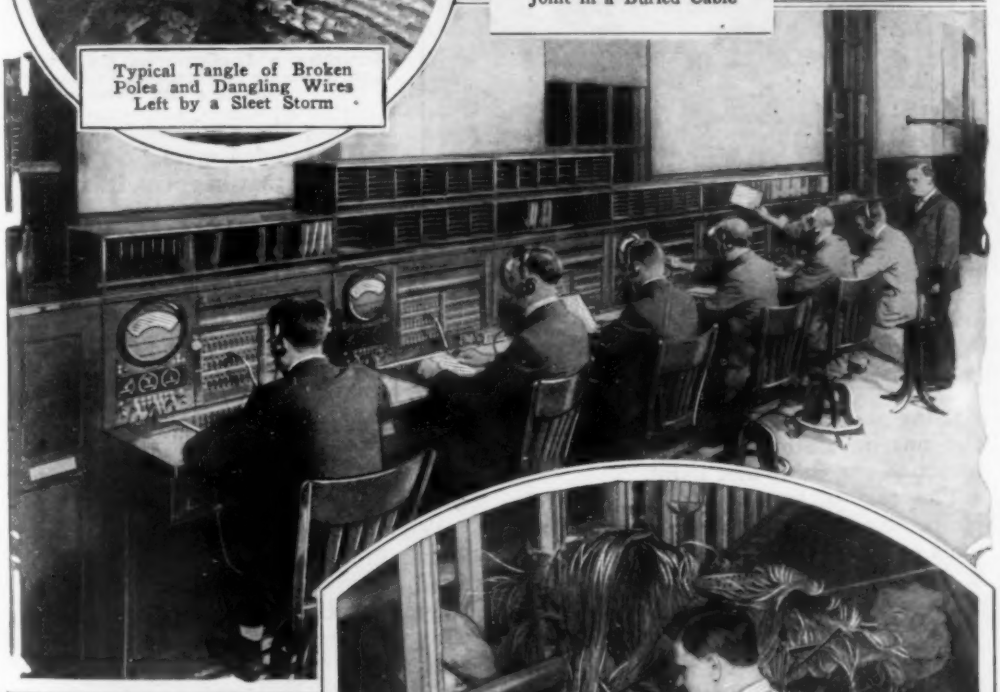
Squirrels have a natural affinity for lead and love to try their teeth on it. Wherever overhead cables run through squirrel country the linemen get frequent calls to repair the damage they do. Sewer rats in the cities frequently eat their way through the lead in the underground conduits.

There was a time, a few years ago, when a tiny parasite which lived largely on a lead diet threatened to ruin the telephone-cable business, but investigators found a mate-

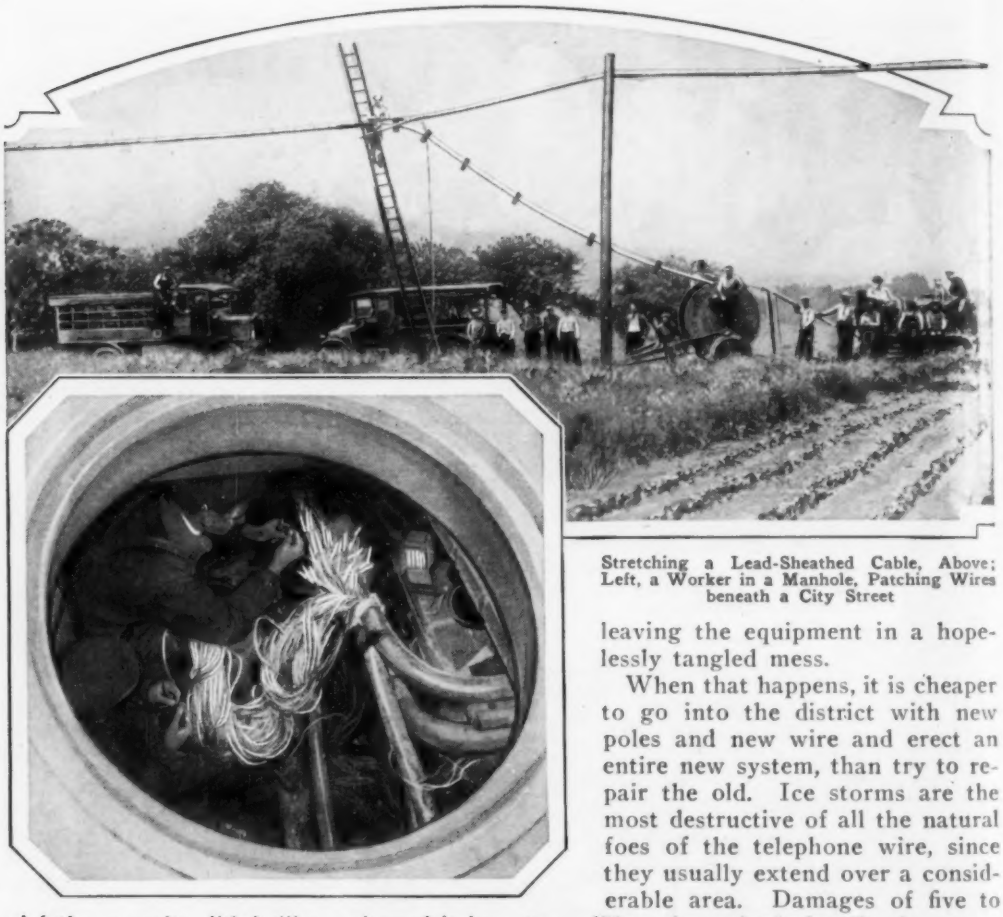


Typical Tangle of Broken Poles and Dangling Wires Left by a Sleet Storm

Lineman Using a Radio Set to Locate a Faulty Joint in a Buried Cable



Above, a Long-Distance Test Panel in a Big Exchange, Where Experts Check the Condition of All Circuits, and, in Case of a Break, Determine Its Location; at Right, a Lineman Is Splicing 2,200 Pairs of Phone Wires in One Cable



Stretching a Lead-Sheathed Cable, Above; Left, a Worker in a Manhole, Patching Wires beneath a City Street

rial the parasite didn't like and used it in the inner insulation, effectively curing the insect of the cable-diet habit.

The cost of keeping the nation's telephone lines working runs into untold millions each year. Every long-distance line is divided into sections, with their repair crews and trouble doctors, just as a railroad has dispatchers and section men to keep it open and in order. In the mountains and the northern states, where snow often buries the overhead wires in winter, the patrol crews, using snowshoes, skis and dog sleds, must be on constant watch. Near the end of winter sudden temperature changes may turn rain into sleet and freeze an ice coating over the wires. In one such disastrous storm northeast of St. Louis, a year or so ago, it was estimated that two tons of ice froze on single wires between poles, pulling the entire network down, breaking the poles off short and leaving the equipment in a hopelessly tangled mess.

When that happens, it is cheaper to go into the district with new poles and new wire and erect an entire new system, than try to repair the old. Ice storms are the most destructive of all the natural foes of the telephone wire, since they usually extend over a considerable area. Damages of five to ten millions in a single locality is not an unusual bill to pay for one of the nature freaks that leaves trees and wires coated with a charming film of ice.

Windstorms and tornadoes, while they wreak immense havoc, are usually confined to a smaller area. A tornado may sweep a path a quarter of a mile wide across a state or two, but even so damage is confined to a relatively small space.

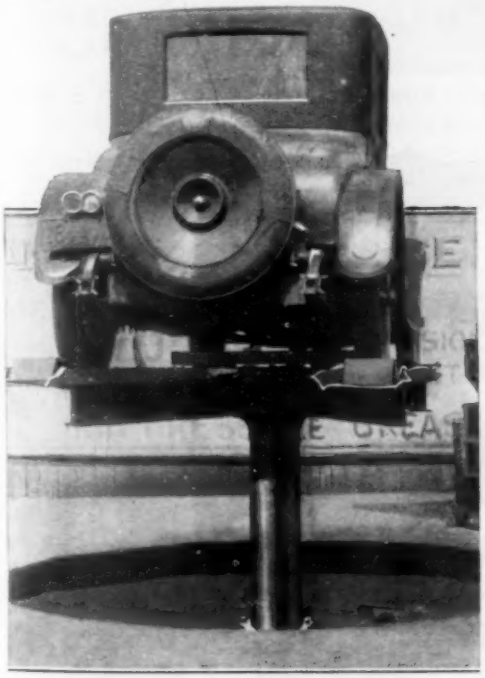
To cope with storms, the country and suburban repair crews, mounted on motorcycles and automobiles, have an elaborate organization. At the first sign of storm each man knows what he must do, without waiting for orders from headquarters. He starts patrolling his section, and then calls in and reports conditions. If the lines are down and no report can be made, he begins repair work immediately, and the office, getting no report, sends help to the scene.

HAWK DROPS SNAKE ON LINE THREE TOWNS GROW DARK

When the electric lights went out suddenly and left three Iowa towns in darkness, the "trouble shooters" immediately investigated while service was being restored from another generating station. Stretched across the high-tension lines and burned almost to a crisp was the body of a two and one-half foot snake. Since the poles were forty feet high, it was considered improbable that the reptile had climbed up. The linemen concluded that it had been dropped by a hawk.

AIR ELEVATOR TO LIFT AUTOS REPLACES GREASE RACK

One of the advantages claimed for an auto lift that may be operated with air or water, is that it elevates the entire car at once, permitting access to all parts underneath and can be used at service stations too small to allow the construction of an inclined rack of the runway type. A frame of channel iron provides a support for the car and the lift itself is of simple design and easily operated.



Car Raised on Lift for Inspection or Repair; It Rests on a Strong Platform of Channel Iron

Descending the Wire Fire Escape; Inset Shows the Grooved Block and Speed Regulator

SAFETY FIRE ESCAPE ON WIRE HAS SPEED CONTROL

Persons slide safely down a wire in a fire escape consisting of a lifebelt attached to the wire by a wooden block, inside which is a curved groove. The strand passes through this slot and, to regulate the speed of descent, the occupant of the belt has but to adjust a thumbscrew on the block, which is done with a wingnut.

OLD MINING PROBLEM SOLVED BY AN ACCIDENT

When a painter carelessly upset his bucket in the ore bins of a California mining company recently, he unwittingly exposed an improved method for precipitating the iron pyrites in the minerals, a process which is expected to yield the mining company as much as $50,000 a year. The paint caused the "foam" on the bins to disappear and the effect was at first considered serious, as the foam had been thought necessary to separate mineral concentrates. Recoveries that day, however, ran twelve per cent higher than usual, for the paint contained linseed oil and kerosene, ingredients that proved effective agents in the process.

Rare Specimen for Bronx Zoo, the Shoebill Stork from Africa; It Occupied a First-Class Cabin

SHOEBILL STORK FROM AFRICA ADDED TO BRONX ZOO

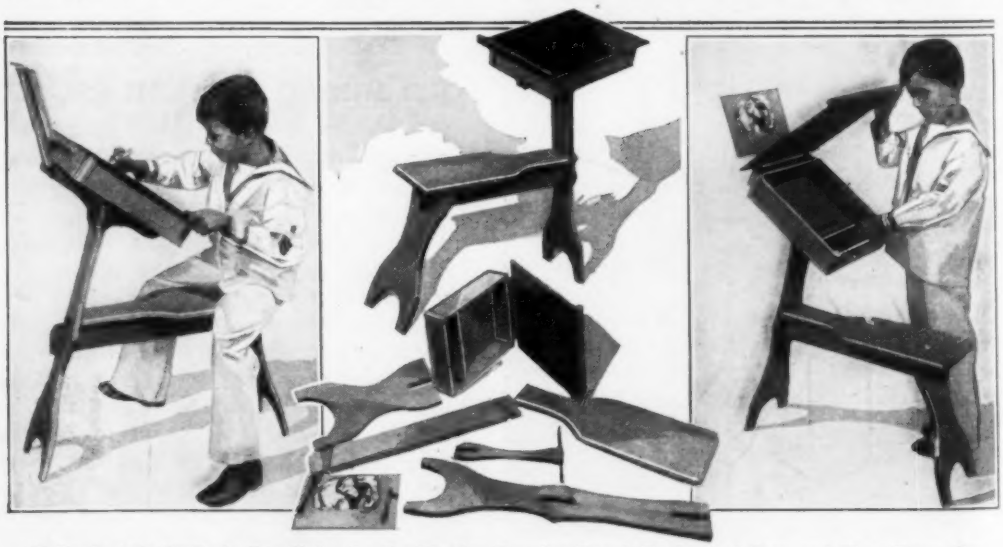
One of the best treated passengers on the steamer "Tymeric" was a rare shoebill stork from Africa, said to be one of the only five that have been captured in the last thirty-five years. It had a first-class cabin next to the captain's quarters on the bridge deck. The room was kept at a constant temperature of seventy-five degrees and the bird was fed regularly on fish. Except for two days of seasickness, it stood the voyage well and was in good condition when it arrived at the Bronx zoo. The specimen was caught, when a young chick, on the upper Nile and nursed until it could stand the trip to America.

OUR "UNLUCKY" COIN

Thirteen occurs in various combinations on the quarter dollar, not the Liberty piece, but no one considers it unlucky to possess the coin and there is really no mystery about the thirteen. It happens to be a repetition of the symbolism adopted for the flag and other insignia to represent the thirteen original colonies. The quarter's face shows thirteen stars surrounding the head, the words "quarter dollar" contain thirteen letters and, on the reverse side, there are thirteen stars above the eagle's head. The motto "E Pluribus Unum" contains thirteen letters, the lower part of the shield on the eagle's breast has thirteen stripes. In the sheaf held in the eagle's left claw are thirteen arrows and the olive branch in the other bears as many leaves.

FOLDING OUTFIT FOR DRAWING HAS SPACE FOR TOOLS

Room for tools and matter to be copied is provided in a box under the board of a

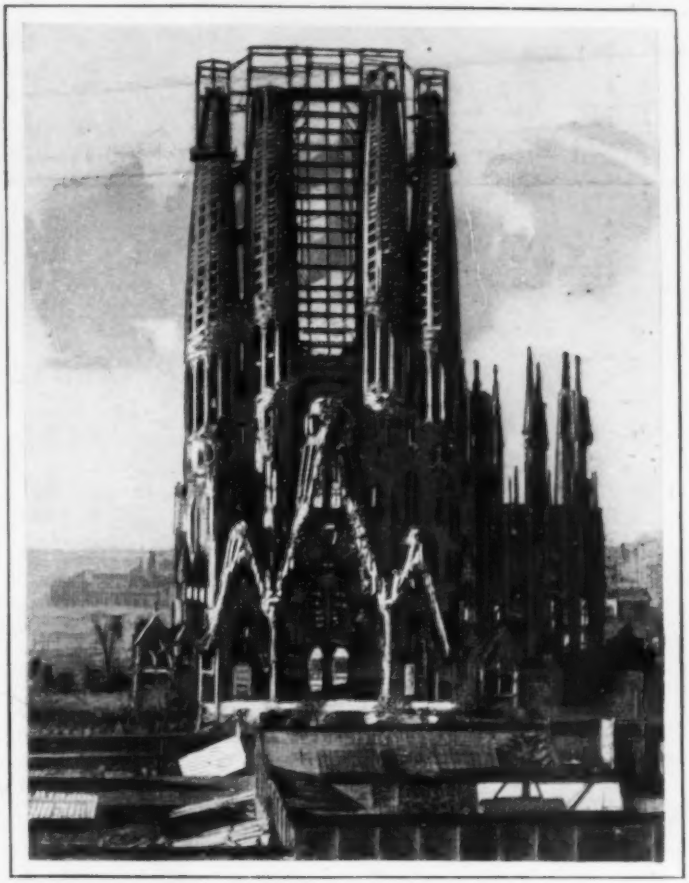


Junior Artist's Studio in One Unit; the Combination Drawing Board, Locker and Seat, and How Pieces Can Be Taken Apart and Reassembled; Holder for Copy at Top of Board

drawing outfit that can be knocked down when not in use and packed away in a small space. At the top of the board is a holder for fastening pictures or drawings.

EARS IN VAULTS FOIL KOBBERS

One of the latest means of foiling the burglar is an alarm system actuated by sound waves picked up by a sensitive microphone within a vault or other place to be protected. It is so adjusted that the ordinary sounds of traffic, voices and other disturbances do not affect it, but the sharp tap of a hammer or the boring of a drill will instantly start the mechanism. The vibrations are relayed to an electrical circuit which rings a gong or other signal, set where the alarm will receive immediate attention, but cannot be heard by the cracksman who probably will work on, unaware that he has fallen into a trap. One of the advantages claimed for this arrangement is that it eliminates the complicated wiring required for many types of alarms, and it has been developed to such a point that false signals are not likely to be sent. This has been accomplished by careful balancing of the microphone to receive only the noise of chiseling or hammering, sounds that have a sharply defined wavelength.

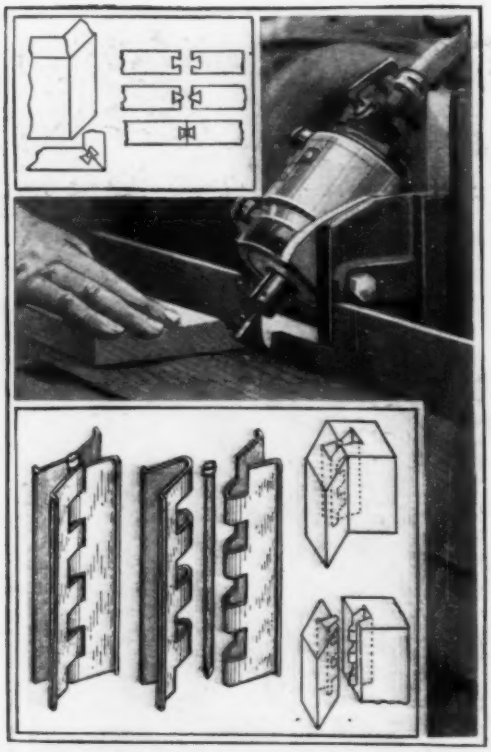


Courtesy The Sphere

An Unfinished Dream in Stone; Weird, Curving Spires and Arches of the Barcelona Cathedral, Commenced Thirty Years Ago

DREAM CATHEDRAL OF CURVES SHOWS NEW NOTE IN ART

Eccentricity, some critics declare, is one of the outstanding characteristics in modern art and, to illustrate their point, cite the unfinished Barcelona cathedral, the dream of the late Antonio Gaudi. The designer cast aside many traditions and sought to achieve his effects through a continued arrangement of curved lines and masses. The spires, as commenced, have started to soar upward but are rounded and the open spaces in them are set in a winding line. Lavish ornamentation that follows the same tendency in curves is found in other parts of the structure, which was started thirty years ago. Caricatures of animals in wood and glass mark the work of other craftsmen.



Diagrams Showing How Lock Joints Are Held Together with Nail, and Photograph of Slot Cutting

LOCK-JOINT WOODWORK KEYS EASILY TAKEN APART

Construction of knockdown cabinets and other similar objects is simplified by the use of steel lock-joint keys that are held together with an ordinary finishing nail. They are inserted in slots which may easily be cut with a spindle routing machine, then dovetailed together and the nail driven in. To take the joint apart, the nail is withdrawn.

OIL KEEPS DRIFT SAND OFF ROAD

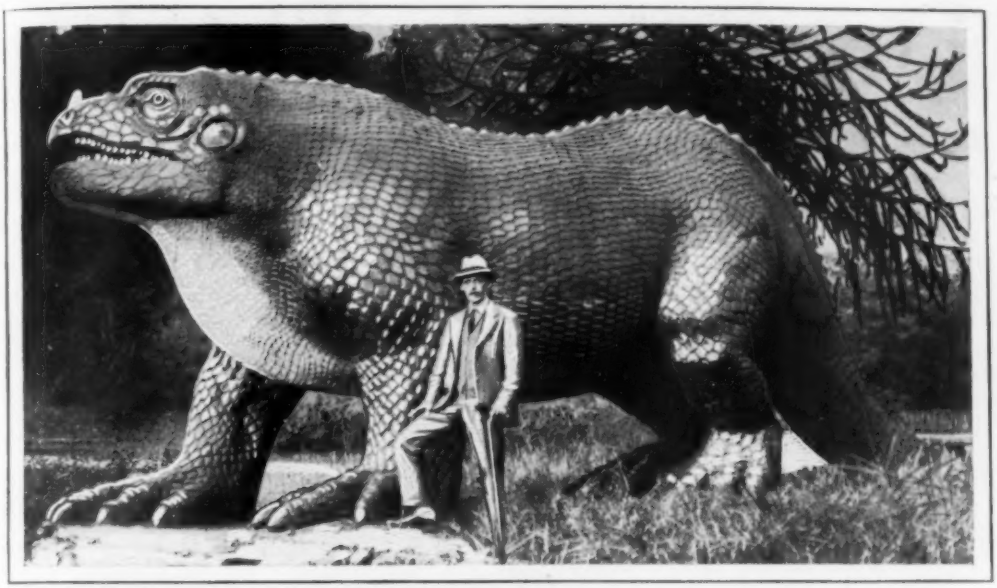
Highway engineers in California and Oregon have been using a mixture of oil and asphalt on the slopes of sand dunes near the roads to keep the drifts from blocking the thoroughfares. Laboratory tests have shown that oil containing from forty to fifty per cent asphalt is best suited to the work. It holds the sand particles together in a heavy mat after the more volatile oils have evaporated. It was found necessary to use not less than half a gallon to each square yard of area to be covered. Following the tests, six miles of highway in the dunes of Imperial county, Calif., have been treated.

LESSONS IN FIRING DYNAMITE TAUGHT FROM AUTO TRUCK

To demonstrate correct methods of handling dynamite and similar explosives in clearing land and for other purposes, the state of Wisconsin sent out an auto truck in charge of two men who gave exhibitions and lessons in half of the counties of the state during a four months' tour. No attempt was made to teach land clearing or stump removal, but stress was laid upon ways and means of safeguarding lives and property. The employment of blasting equipment operated by electricity for long-distance detonating, proper ways to crimp caps, connect fuses and thaw out frozen dynamite were among the principal lessons. The truck was decorated with posters and the driver was dressed in the garb of a woodsman.

SAFETY WITH EXPLOSIVES
A GOOD BLASTER IS AN ARTIST
HE COMBINES: KNOWLEDGE SKILL AND JUDGMENT TO MAKE EXPLOSIVES WORK
HE HAS NO ACCIDENTS
WIS. FARMERS
BUT
BUY OR MAKE A POCKET CAP BOX
LET PYROTOL WORK FOR YOU
PYROTOL
DEPT. OF AGRICULTURAL ENGINEERING - COLLEGE OF AGRICULTURE

The Traveling Safety School the State of Wisconsin Sponsored, to Give Instruction in Firing Explosives



Are Monsters like This Still Alive? Col. H. F. Fenn Is Standing beside Replica of Prehistoric Beast, Such as His Expedition Will Hunt in Congo, Where Natives Declare Huge Creatures Can Be Found

LIVING MONSTERS ARE SOUGHT IN WILDS OF CONGO

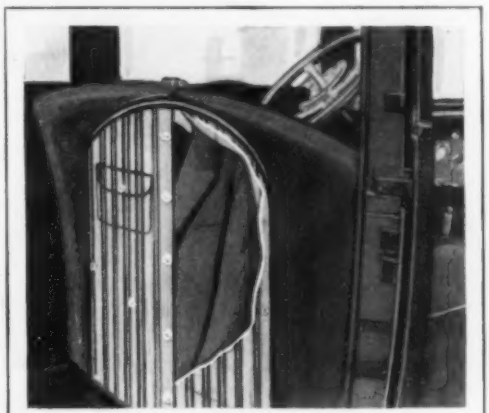
Africa is a land of secrets, and one that has engaged the thought of explorers for many years is the possibility that in some of the remote wilds, huge beasts, long extinct in other parts of the world, are still in existence. Most of these suppositions are based on the tales of natives who declare that they have seen animals of enormous size and strange shapes in the jungles and lowlands bordering the Congo river. Under the leadership of Lieut. Col. H. F. Fenn, a British expedition plans a trip through the wildest sections of the Belgian Congo in search of monsters that may have survived in these fastnesses.

LAND WIRE LAID BY AIRPLANE FOR EMERGENCY TELEGRAPH

Successful stretching of six miles of telegraph wire from an airplane in eight minutes by Swedish engineers suggests a new field of usefulness for flying craft in war, forest surveys and emergencies of many kinds. One end of the wire was attached to a marker and when the plane reached the point where the connection was to be made, the cable was cut from the reel and, weighted, fell to the ground where it was picked up and attached for sending a message. The actual laying of the wire took but six minutes. The connections were made in two.

CLOTHING BAG ON AUTO SEAT HAS COLLAR POCKETS

Attached to the back of the front automobile seat, a bag inclosing a hanger holds a suit of clothes and has pockets for collars, ties and other accessories. The cover fits securely over the contents, to keep out dust and prevent wrinkling.



Suit Hanger Adjusted on Back of Automobile Seat; It Has Pockets for Collars and Other Accessories

Do Animals Think?

Brains Differ and Many Species Show High Intelligence, but Stage and Circus Tricks Are Seldom Based on Natural Aptitude

By J. EARLE MILLER

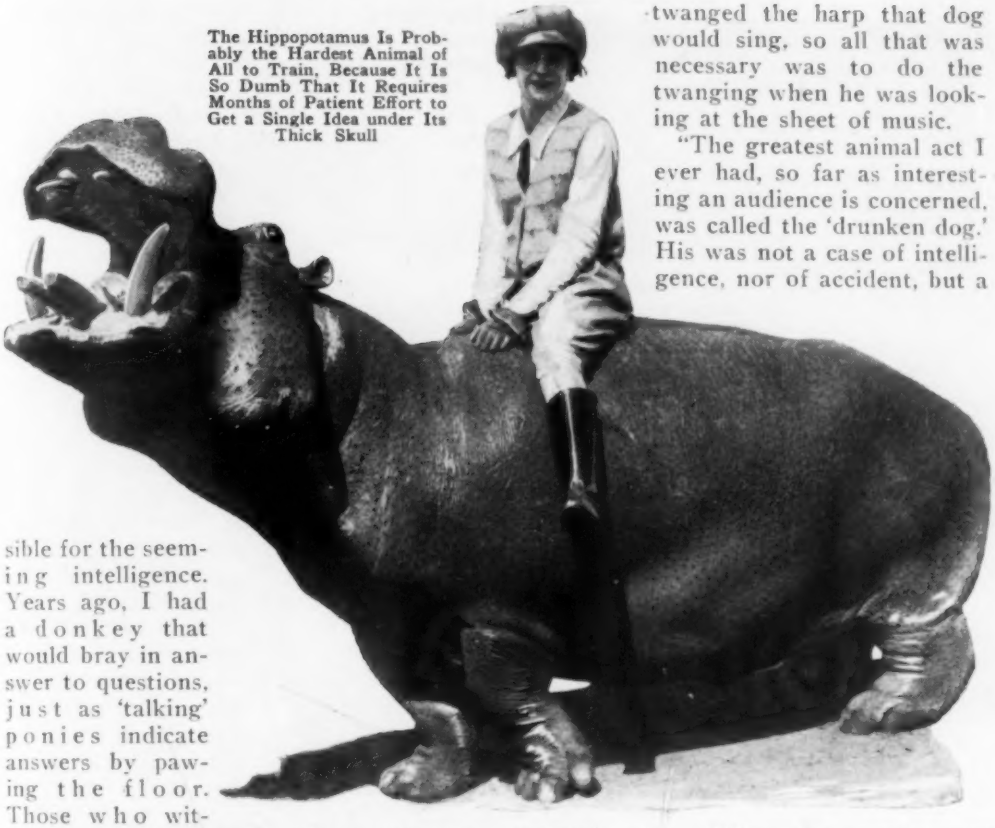
"TO one who has spent a lifetime handling everything from elephants and lions to the proverbially silly geese, there is plenty of evidence that most animals have mental ability," says Albert E. Parker, superintendent of the Lincoln park zoo, of Chicago. But, he adds, the evidence on which the average person would base that claim—the clever tricks seen on stage and in the circus ring—is not worth considering. For stunts by the animals are usually based on tricks of the trainer.

Down in the bear pits at Parker's zoo is a big grizzly that probably would tip the scales at around a half ton, an inveterate peanut beggar. Most of the peanut feeders frequent the hill above the rear of the den, where they can drop the nuts without throwing them through intervening bars. The grizzly long ago learned to sit up and beg for them, and with a desire for more comfort, found he could convert himself into an animate rocking chair by catching his rear paws with his front claws and rock back and forth on the tip of his spine. He learned that trick for himself—a sign of reasoning.

The animals in the lion house, which contains, in addition to a fine collection of jungle kings, a varied assortment of the cat tribes, including Royal Bengal and Siberian tigers, black leopards from Asia, spotted leopards and American mountain lions, are fed six days a week, four days on beef and twice each week on liver. The beef is accepted without much notice, but on the liver days—liver being a highly prized delicacy—there is a terrific uproar as soon as the keeper enters the building with his baskets. That, to the uninitiated, looks like intelligence. As a matter of fact, however, it is merely well-trained noses that can smell liver fifty or a hundred feet away.

"It is hard to tell offhand," says Parker, "what is intelligence and what is not in trained animals, since a trick on the part of the trainer is more apt to be respon-

"Mustang," a Four-Footed Boxer Who Has Been Trained to Wield the Gloves, Sometimes Forgets in the Clinches and Starts to Use His Teeth



The Hippopotamus Is Probably the Hardest Animal of All to Train, Because It Is So Dumb That It Requires Months of Patient Effort to Get a Single Idea under Its Thick Skull

sible for the seeming intelligence. Years ago, I had a donkey that would bray in answer to questions, just as 'talking' ponies indicate answers by pawing the floor. Those who witnessed our 'conversations' thought the donkey was wonderfully intelligent, whereas it was all a trick. One day I was sandpapering a board and, when the donkey heard the rasping sound, he started to bray. All I did to polish off the act was to glue two pieces of sandpaper to boards, making them easier to handle. A confederate, stationed behind a barrel, rubbed them together at the proper time and the donkey brayed.

"Another of my animal acts was a singing bulldog. When I held a piece of music in front of him, the dog threw back his head and began to howl. Then I would turn the paper over, show him the blank side, and he would remain quiet. Or, for variety, I would ask someone in the audience to lend me a newspaper, and demonstrate that it had no effect on the dog; he sang only to music. The secret was the accidental discovery that, like many dogs, his ears were extremely sensitive to certain sounds, notably that of a jews'-harp. So long as I or an assistant twanged the harp that dog would sing, so all that was necessary was to do the twanging when he was looking at the sheet of music.

"The greatest animal act I ever had, so far as interesting an audience is concerned, was called the 'drunken dog.' His was not a case of intelligence, nor of accident, but a trainer's trick. When the curtain went up, it disclosed an empty stage, with a small building, marked saloon, against the right wing. The dog came from the left, walking on his hindlegs, carrying a tin cup attached to one paw. He walked across the stage, entered the saloon, and in a moment reappeared, with his cup bubbling over with froth, while with a foolish expression, he ran his tongue over the outside of his jaw, as if licking off the last drops. He would walk a few steps, sit down and lick his jaw, get up and walk a few more, and then do the same performance over again.

"The explanation is simple enough. It takes about half an hour to teach a dog to walk on his hindlegs, and that was the hardest part of the act. The cup was tied to his paw, so he couldn't drop that. When he entered the saloon, I was waiting in the wings with a piece of paper smeared with bacon. I quickly rubbed that over his jaws and nose, filled the cup with cotton to represent froth, turned the dog

A Baby Elephant Taking a Pair of Lion Cubs Out for an Airing and "Snooky," the Chimp, as a Photographer; at Bottom Is Another Elephant Stunt. These Are Among the Most Intelligent Animals

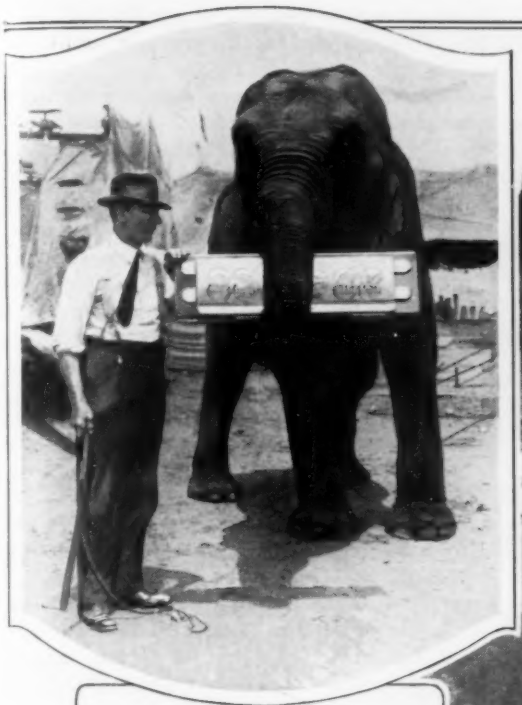
around and started him back across the stage. Trying to lick off the bacon grease, of which he was fond, he would run his tongue around his jaw, and, finding it too difficult to walk on his hindlegs and reach the grease on his nose, he would squat down for a moment, and then get up and proceed a few steps, as I, having run around to the opposite wing, motioned him to come on.

"In another act a black leopard mounted a ball and rolled it across the arena. This performance was the result of an accidental discovery that he liked to climb on things and exercise his claws, so I built him a ball, covered it with canvas, and let him climb on. As he clawed, the ball rolled. If I walked toward him with the whip, he tried to back away, rolling the ball away from me, and if I backed up, he rolled it toward me. Most ball rollers, like juggling sea lions, are similar accidents.

"A good part of the work of training animals or birds for the stage or circus revolves around chance discoveries; you observe some peculiarity in your subject and then build your act around it. A friend of mine had a big chimpanzee he was trying to train, and almost gave up in despair because of two peculiarities of the animal. One was that, when he stood up and walked, he threw out his chest in a striking manner, and the other that all the time he walked he kept waving one hand up and down.

"I was called upon for advice, and after watching the chimp solved the problem. We dressed him in women's clothes, his chest expansion adding to the illusion, shaved off his hair to give him a smooth face, painted it with clown-white, daubed on two big red spots for cheeks, and then tied a lace handkerchief to the waving hand. When he walked across the stage, waving his handkerchief at the audience, it brought down the house—a marvelous exhibition of intelligence, the audience believed. Later the trick was improved by walking the animal backstage before his act until he was fairly tired. The result was that, when he

Bottom Photo © U. & U.



The Big Queen of a Circus-Elephant Herd, Tries Her Lung Capacity and Tongue on the World's Largest Harmonica

Headphones Are a Tight Fit for 742 Pounds of Grizzly Listening In on the Radio and Enjoying the Music

At the Left, in Shirt Sleeves, Is Superintendent Parker, of the Lincoln Park Zoo, with Billy, One of His Trained Chimpanzees, Who Dresses Himself, Rides a Velocipede and Shows Other Marks of High Intelligence; Above Is a Fighting Kangaroo Trying His Tail Spring at the Circus Winter Quarters

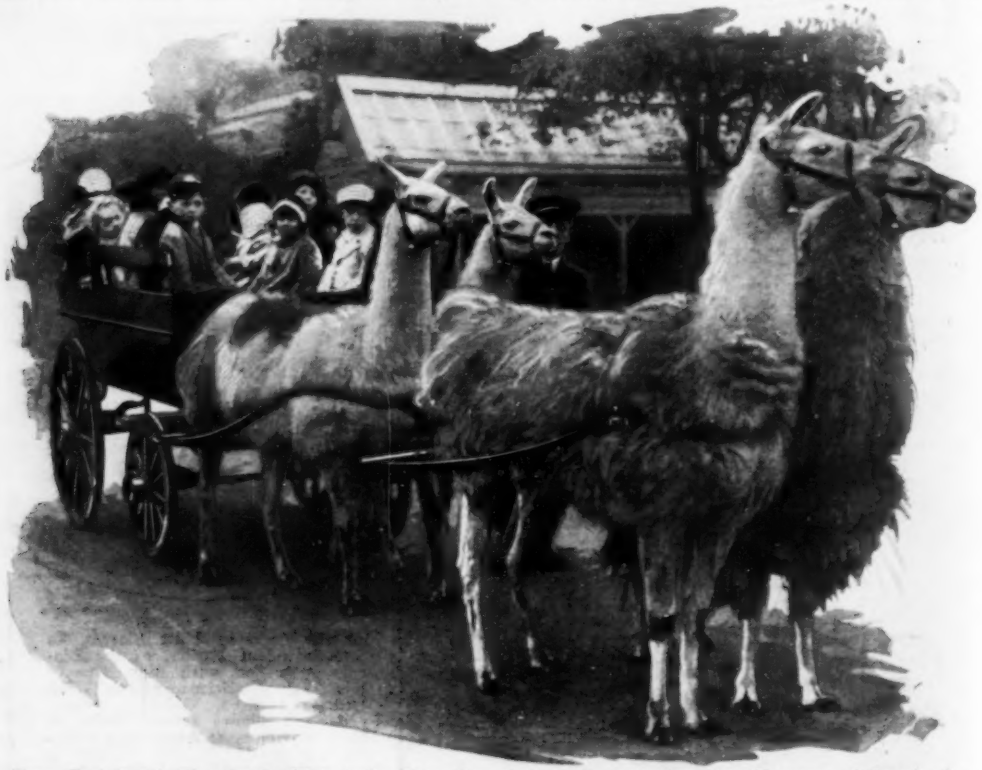
started across stage, he would walk a bit, then sit down to rest, all the time waving the handkerchief.

"One of the circus novelties in recent years has been a young hippo ridden either by a monkey or a boy. The hippo is very dumb, too dumb to train, but will let you place a load on his back, and will then follow a keeper around, particularly if the keeper holds out a bit of food. But take the keeper away, and the hippo wouldn't work, for he hasn't brains enough to be trained to go through an act alone.

"A hippo born in captivity, by the way, is better for that stunt than a wild one, for like most animals so born, it has not the intelligence of the native jungle beast. Animals, in their various grades of intelligence, run quite a lot like people. The fellow who has had everything brought to him during his life isn't apt to be quite as quick a thinker as the one who has had to scratch for a living. Animal trainers have found that it is cheaper to pay $800 or $1,000 for a jungle-born lion cub to train than to accept a cage-born one as a gift. The jungle cub who has had to fight for his own living is far more intelligent.

"Training, by the way, has changed remarkably in recent years. The old days of whip and tackle have disappeared, principally because training has attracted a more intelligent class of men. About the most severe bit of training nowadays is to withhold a meal or two to sharpen the animal's wits. There again they are very much like humans—they think faster and better on an empty stomach than on a full one. And that, and not a desire to break them by starvation, is the real reason for depriving them of food. You can break an animal by starving it half to death, but you break its spirit, too, and that shows up in your act.

"The usual way is to withhold two or three meals, just enough to give a good appetite, and then teach the act. For example, if you want to train a donkey for a clown act in the ring, and the stunt is to teach him to bump the clown out of the circle, the usual way to go about it is



From Pack-Saddle Duty in the High Andes These Four Llamas Have Graduated to Harness and Cart in the London Zoo, Where They Are Used to Give the Visiting Children Short Rides

to start by missing feeding one day. Then the clown smears the back of an old suit with a mixture of bran and molasses, and lets the donkey approach to lick it off. When he arrives, the clown shoves back, bumping the donkey, and the donkey promptly returns the shove to reach the bran, whereupon the clown does his comedy fall. After that the donkey is rewarded with an apple or a lump of sugar. Eventually he associates the reward with the shove, and the bran mixture can be dispensed with.

"Such tricks take only time and painstaking care, and aren't particularly dependent on the animal's intelligence, except that some associate act and reward more quickly than others. All circus and stage tricks, however, become more or less automatic in the animal's mind. They go off well so long as they are performed in a certain rotation, but if the order is changed, the act will be a failure."

EGG STANDS 16 POUND HAMMER
STRONG THICK SHELLED EGGS
1. SHIP BEST
2. KEEP BEST
3. EVAPORATE LEAST
EGG SHELL STRENGTH
MAY BE IMPROVED BY
THIS IS A REAL EGG
THIN SHELLED EGGS
STRONG SHELLED EGGS
PREPARED BY CORNELL UNIVERSITY POULTRY DEP'T. ITHACA N.Y.
FEEDING AND BREEDING SUGGESTIONS
1. OYSTER SHELL
2. GRIT
3 BONE MEAL
4 COD LIVER OIL
5 BREED ONLY FROM HENS LAYING STRONG SHELLED EGGS

Geared Trip-Hammer Apparatus for Testing the Strength of Eggshells; Force of Blows Was Accurately Measured

TEST STRENGTH OF EGGSHELLS WITH HEAVY HAMMER

That eggshells are not as fragile as is commonly supposed has been demonstrated with a testing machine devised at Cornell university. A sixteen-pound hammer is so adjusted that it swings against an egg at the rate of three blows a minute. There was no breakage of the strongest shells at sixteen pounds. Eggs of this quality are considered better for shipping and are said not to spoil so readily.

COMPRESSOR FOR VALVE SPRING SIMPLIFIES AUTO REPAIRS

One of the advantages claimed for a valve-spring compressor is that it is self-locking so that both hands can be used to remove collars or keys in dismantling the auto motor. A high ratio of leverage is obtained by means of an operating handle running on a roller against the main bracket. When using the compressor on heads, it is not necessary to remove inlet or exhaust manifolds, as the instrument is applied on the opposite side. It is adjustable to different engines.

BATS AS AID TO APPLE CROP HELP DESTROY MOTHS

Havoc wrought on apple crops by the codling moth can be greatly reduced by bats, according to one authority. Study of the creatures in the Yakima valley, Wash., showed that moths composed nearly ninety-five per cent of their food. In Texas, bats have been helpful in devouring malaria-carrying mosquitoes.

WORLD CROSSED IN A STRIDE ON MERIDIAN LINE

One Step and He's across the World! The Row of Stones at Greenwich, Dividing East and West

Stepping across the earth from the west to the east side or vice versa is a simple matter at the royal observatory in Greenwich. A row of stones with a line carved down their center marks the official meridian where east touches west and on which official time and other calculations are based and furnished to the world.

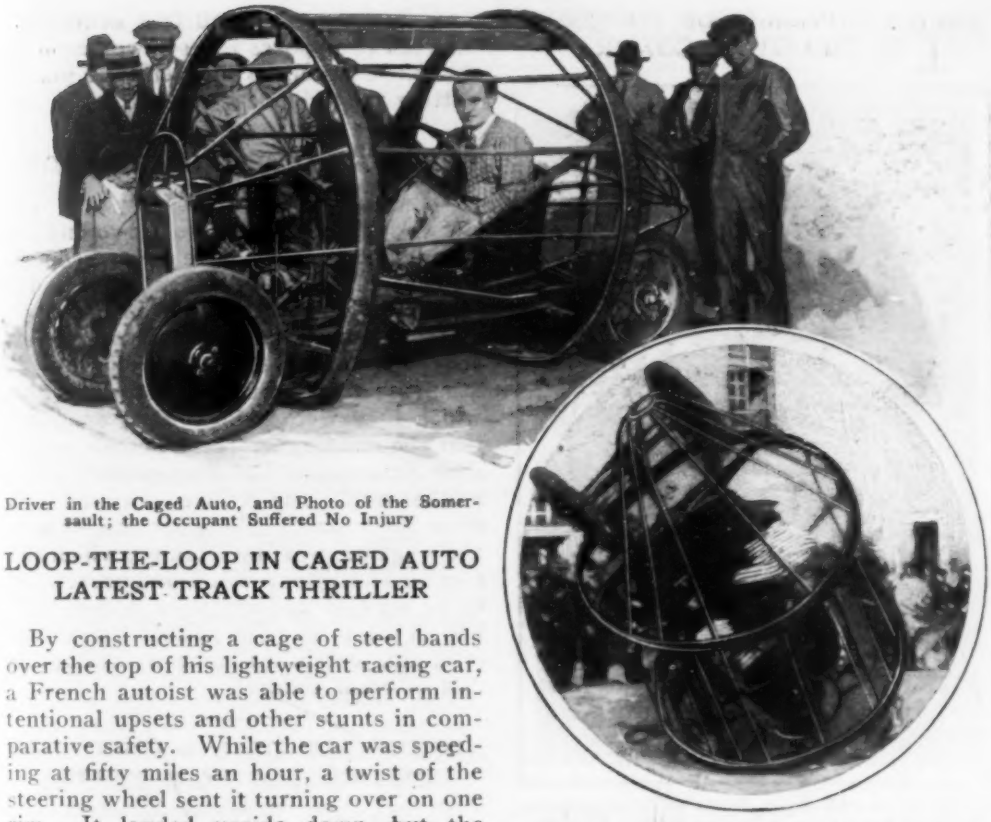
SHOP-WINDOW DISPLAY TEST MADE ON SHOPPERS

What type of advertisement attracts the most attention from the pedestrian hurrying past the store window? In an effort to answer this and other questions relative to the effectiveness of shop displays, investigators of the business school at Columbia university made tests with stop watches on persons who halted before pictures, advertisements and other attractions placed in a New York City shop window. The observers were hidden and prepared tables giving the relative attention directed to the different exhibits. Only about one-third of the total number of persons watched glanced in passing. Only five per cent stopped for closer inspection. As a rule, women paid more attention to pictures of women, and men seemed more interested in advertisements featuring men. Of twenty pictures that drew the most notice, only half were of figures partly clothed. Children under ten years old showed the greatest interest in the displays. Colored persons of all ages paid less heed than did whites. A young man and a young woman used as decoys proved more effective in drawing a crowd than the window display alone. The time spent in looking at the exhibits varied from one-third of a second to a minute and a half, the average being about eight seconds. Upon the whole, men showed a greater tendency to pause than did women. The place chosen for the experiment was considered representative of a cosmopolitan city neighborhood. An average of eighteen pedestrians passed the window every minute.

SANITARY VENDER FOR BREAD PREVENTS DRYING

Bread is kept fresh and free from dust in a glass holder, which dispenses one or two slices at a time when a slide is pulled out at the bottom. The container is furnished in three, four or six sections, for large quantities or different kinds of bread.

Safe from Dirt and Where Customers Cannot Handle It; Bread in Sanitary Restaurant Dispenser



Driver in the Caged Auto, and Photo of the Somersault; the Occupant Suffered No Injury

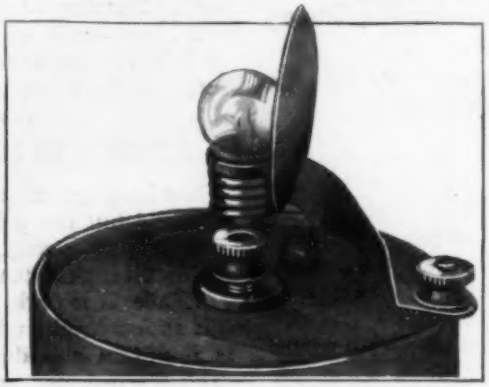
LOOP-THE-LOOP IN CAGED AUTO LATEST TRACK THRILLER

By constructing a cage of steel bands over the top of his lightweight racing car, a French autoist was able to perform intentional upsets and other stunts in comparative safety. While the car was speeding at fifty miles an hour, a twist of the steering wheel sent it turning over on one rim. It landed upside down, but the driver was not injured.

METALS AS FUEL

Just as ordinary fuels are used, some metals are burned for the sake of the heat and light they produce. The essential difference in the process is that the products of the metallic combustion are not gaseous but solid. Under certain conditions the burning of aluminum yields sapphires and rubies instead of ashes. Magnesium is used to produce "star" fireworks. A shell packed with the metal and attached to a parachute is fired electrically high in the air. Pieces of this material were employed during the war. Aluminum has been found to be a good fuel for producing an intense heat for welding. In this field, the metal has assumed industrial importance in this country and abroad, the process being known as thermite welding.

BULB ATTACHED TO DRY CELL CONVERTS IT INTO LAMP



Bulb Attached to Dry Battery; Circuit Is Completed by Pressing Bracket against Center Post

Quickly attached to the ordinary small-voltage dry battery, an electric-light bulb has a reflector that may be turned to focus it anywhere. The fixture, which is patented, is connected to the negative post and the circuit completed by screwing up the nut on the positive post.

PAPER PETALS TELL WEATHER BY CHANGING COLOR

THE MAGIC BAROMETER FLOWER
This little flower you must greet,
Is something of a sensitive plant.
Place it in the open air,
If it PINK when stormy, BLUE when fair,
And turns a lovely LILAC hue,
When undecided which it will do.

Chemically Treated Paper Petals of This Imitation Blossom Change Color to Indicate Weather Changes

Imitation flowers with chloride-of-cobalt treated petals, which change color with variations of the amount of moisture in the atmosphere, have appeared recently. They are an adaptation of the chemical hygroscope invented some fifty-five years ago. In dry weather, the flowers are bright blue, but when the air is moist, they change to a pink and assume a dull lilac hue during intermediate conditions.

WOOD-WHEEL SPOKE WASHERS PREVENT ACCIDENTS

Loose, squeaky or otherwise unsafe wooden wheels on autos or other vehicles are tightened with washer-shaped units snapped around the tenons of the spokes. To adjust them, a small jack is centered between two spokes and screwed up until the felloes are lifted sufficiently to permit putting the tighteners in place.

CHILDREN LIVING IN WOLF DEN FOUND IN INDIA

Two little "wolf girls," one two and the other eight years old, were discovered near an isolated village in Bengal, British India, not long ago. They were running on all fours and uttering guttural barks. Persons who found them had difficulty in removing them from the wolf cubs with which they were living. It is supposed that the children had been abandoned by their parents and had been reared by the mother wolf. The younger one died soon after the rescue. The elder fought savagely against wearing clothing, which she tore off even after it was sewed on, refused to be washed and ate from a dish with her mouth in it. She neither laughs nor cries and prefers the company of dogs to that of other children.

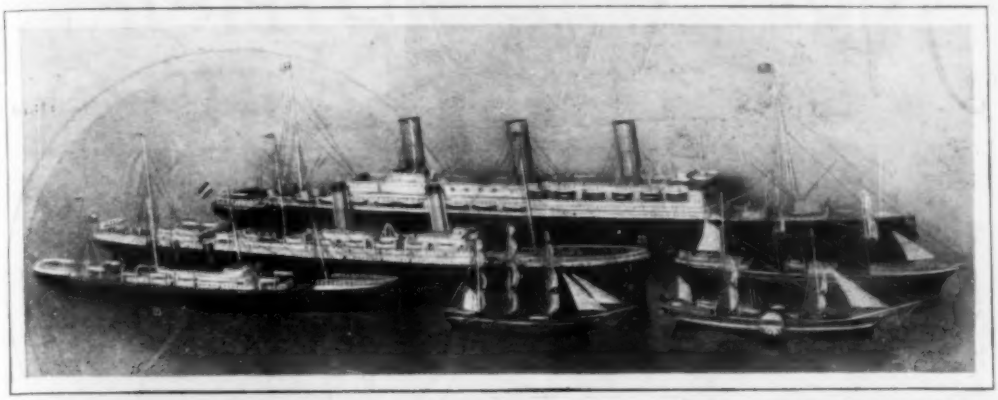
ADJUSTABLE DIAL MARKS TIME FOR DEVELOPING PICTURES

Attached to a wall or shelf edge where it is easily seen, an adjustable timing dial for photographers indicates the period for leaving photos in the wash or fixing bath. Spacing of the hands on the dial is readily changed by loosening a screw in the center of its face.

SILICON IS NEWEST METAL

Not long ago, silicon sold for about $225 a pound but the price is now fifty cents. The drop is largely due to the fact that the metal is produced electrically at Niagara Falls. It is dark, almost black in color, but shows bright when cut, like lead. It is found in abundance in nature, beach sand, for instance, containing about forty-seven per cent silicon.

PROGRESS OF TRANSPORTATION SHOWN BY MODELS



Maritime Progress of Several Decades Seen at a Glance; the Story of Shipping as Told by a Collection of Models from the Days of the Side-Wheeler to the Modern Liner

The great strides made in providing safe, comfortable and rapid means of travel across the Atlantic are seen at a glance in a collection of models shown in New York. The early years of steamer journeys are represented by a replica of an old side-wheeler, and a model sailing vessel recalls the years of voyaging between the old world and the new before steam was harnessed to ships. In the background is a realistic reproduction of a modern ocean liner.

SILENT GEAR FOR STREET CARS TO REDUCE WEAR

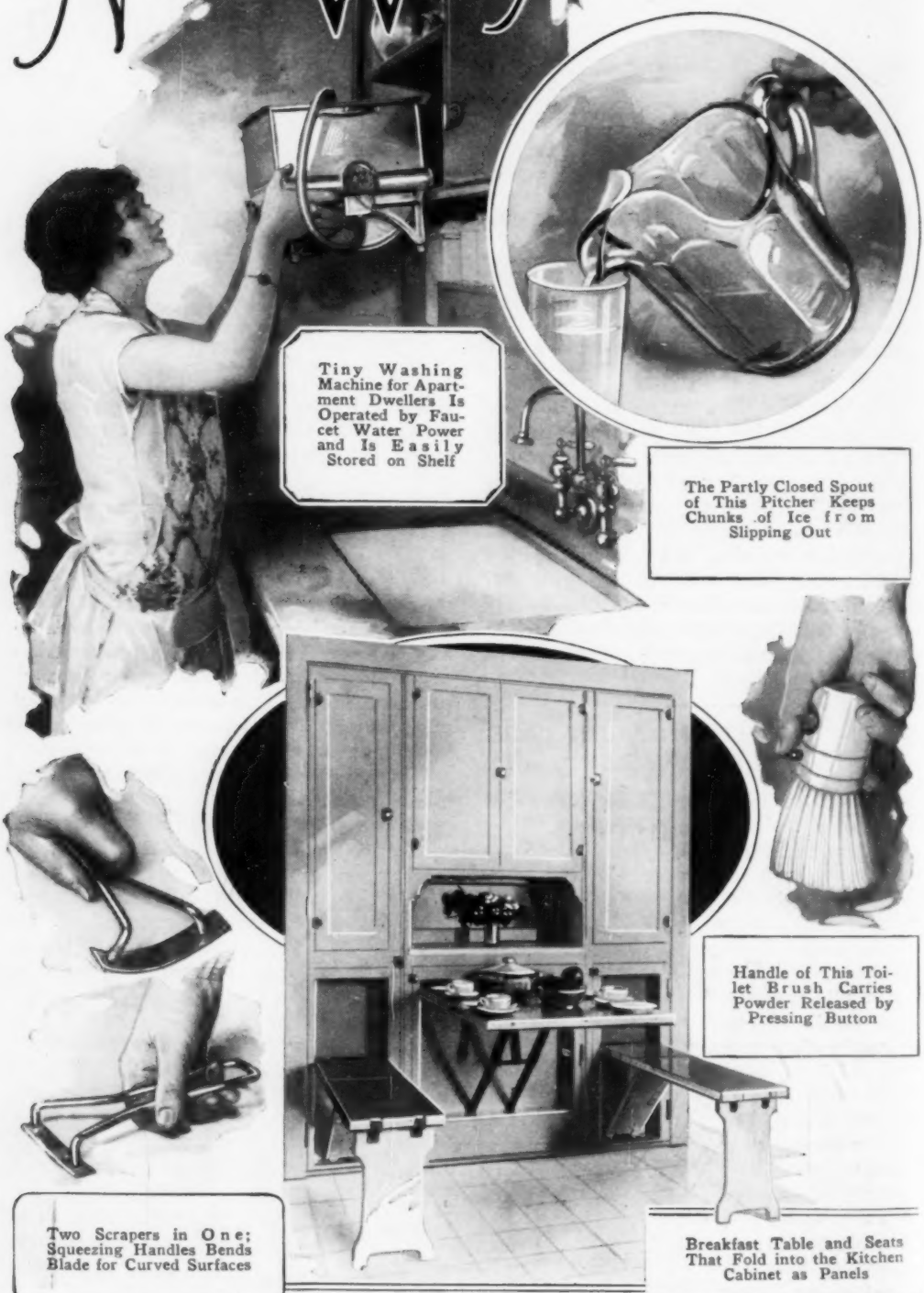
Quieter running and longer life for equipment are among advantages claimed for a new type of motor drive for street cars introduced in Switzerland. Instead of the usual arrangement of trucks, there is a middle one with four small wheels to carry the motors which drive two-wheel trucks at each end of the car by means of a transmission shaft similar to that of an automobile. The axles are arranged so that one wheel turns faster than its mate when rounding curves. Driving and transmission parts are dustproof and lubricated under pressure.

TRY NEW PRINCIPLES OF FLYING IN NOVEL DIRIGIBLE

Adaptation of new principles of flying and design, adds interest to the construction of a dirigible by a California inventor and engineer. The method of propulsion proposed for the ship is to remove the air pressure from the nose of the bag and transfer it to the rear, thus effecting a forward movement. The usual type of propeller has been discarded for a many-bladed disk to achieve this purpose. Plans call for a dirigible, 212 feet long and fifty-three feet in diameter. It will hold 242,000 cubic feet of hydrogen gas, and with a gross lift of 17,000 pounds will be able to carry thirty-five passengers. The outer envelope will be of a lightweight metal and the ship is expected to be twenty per cent lighter but will take a pay load three times greater than other types of airships of the same dimensions.

Model of New Style Dirigible with Its Revolving Nose Disk That Supplants the Ordinary Propeller

New Ways to avoid



Tiny Washing Machine for Apartment Dwellers Is Operated by Faucet Water Power and Is Easily Stored on Shelf

The Partly Closed Spout of This Pitcher Keeps Chunks of Ice from Slipping Out

Handle of This Toilet Brush Carries Powder Released by Pressing Button

Two Scrapers in One; Squeezing Handles Bends Blade for Curved Surfaces

Breakfast Table and Seats That Fold into the Kitchen Cabinet as Panels

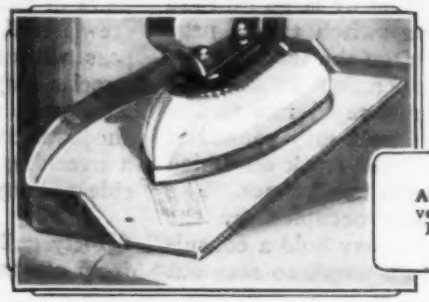
Anyone wishing further information on devices described in the editorial pages can

Home Drudgery

Electric Ironer Operates with House Current and, When Not on Duty, Can Be Quickly Converted into Table as Shown in Upper Picture

Runs in Stockings and Other Articles Are Easily Mended with This Little Needle Outfit

French Salad-Dressing Bottle Is Marked to Show the Proper Proportions of Oil and Vinegar to Be Mixed



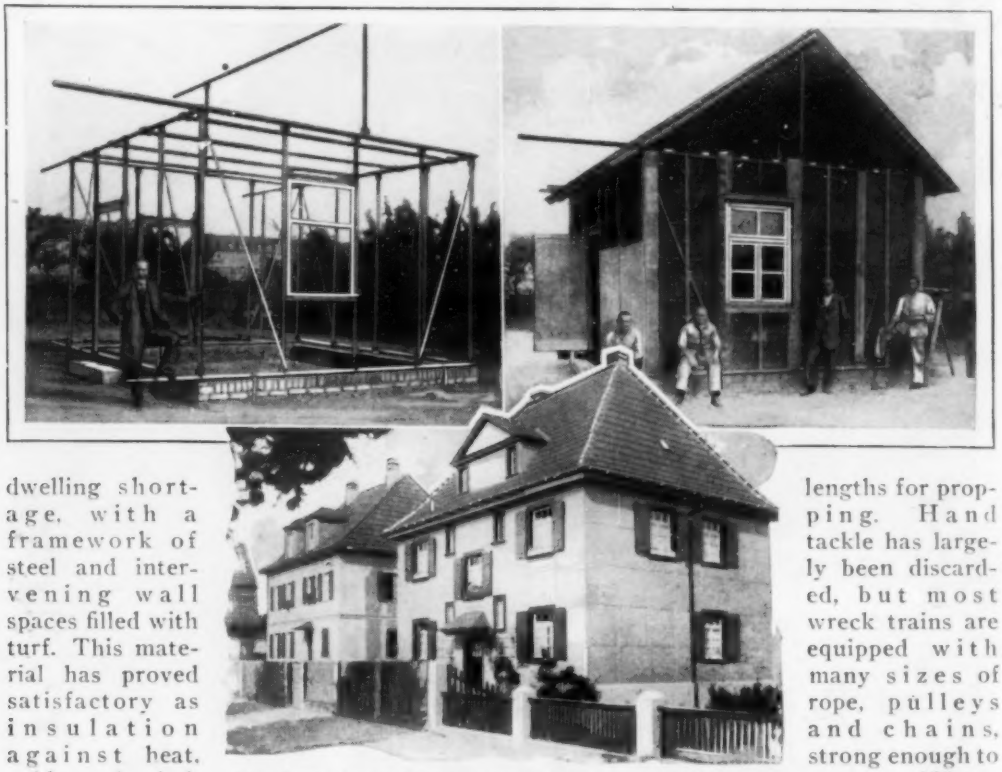
Useful for Many Tasks, This Stool, with Disappearing Step, Has Flat Feet So That It Will Not Tip, and Fits under the Sink

Asbestos Holder Prevents Flatiron from Falling or Burning

obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.

HOUSES OF STEEL AND TURF CUT BUILDING COST

Cheap, serviceable houses are being constructed in Germany as a solution of the dwelling shortage, with a framework of steel and intervening wall spaces filled with turf. This material has proved satisfactory as insulation against heat, cold and wind. As no water is used in the building process, quick possession after completion is possible. As shown by the illustration, the finished house has an attractive appearance.



Two Stages in the Construction of the Steel and Turf Houses, and Completed Dwellings Showing Homelike Appearance

WRECK TRAINS ALWAYS READY LIKE FIRE ENGINES

Always prepared for emergencies, the wreck trains maintained by large railroad systems are kept on switch tracks near the main line, and often the fastest locomotives are in the engine house with steam up ready for a rapid run to the scene of trouble. A train may consist of four or five cars and the track on which they stand is kept clear at all times. The rear car is generally occupied by the crew and officers who may hold a consultation on the way to a wreck to map out a plan of action. There is also space for rope, chains and other equipment. The next car holds pieces of timber, ranging from wedges, to be used under the wheels or jacks, to square posts of various lengths for propping. Hand tackle has largely been discarded, but most wreck trains are equipped with many sizes of rope, pulleys and chains, strong enough to move a 100-ton weight. The next car contains two or three sets of extra trucks, with wheels attached, to replace those that may be broken, for these are usually more severely damaged than others. Next to the locomotive, is the crane car on which swings a great steel arm, whose "muscles of chain" will raise fifty tons at a time and guide the load through the air, doing the work of 500 pairs of hands. The life of the wrecking crew is full of uncertainties. Weeks may pass without any call and then several wrecks may occur within a few hours. The train is always stationed near the shops where the men work when not on a wrecking job. They are obliged to reside near by so they can respond quickly.

¶Fifty gallons of alcohol were produced from one ton of straw in England.

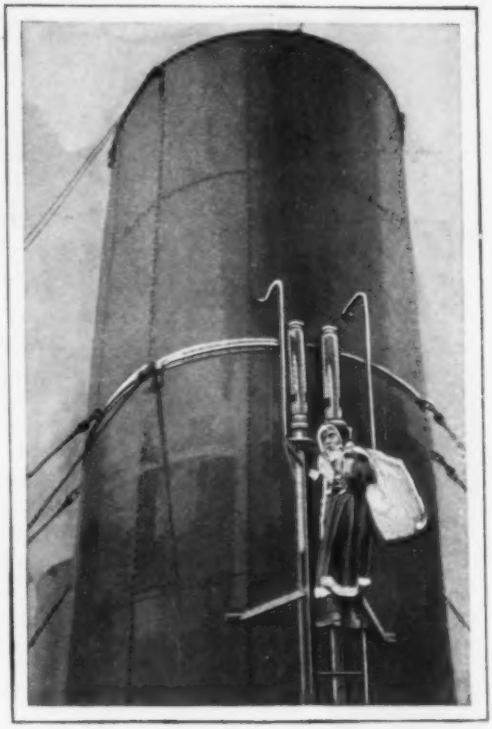
HOW VOICES FROM SEA GUIDE SHIPS TO PORT

Great liners are being guided to port by means of a "leader cable," sunk in the ocean bed, the electric signals from which warn of dangerous channels. A message in Morse code is sent along the line and is received as a "musical singing note" in the "ear" of incoming vessels, a sensitive instrument hung over the sides for the purpose. The sound is conveyed by telephone to the navigating officers who are assured they are on the right course by following the directions from the cable voice. Experiments have been made with different-colored lights on the bridge illuminated by current sent through the cable, but, so far, the speech signals have been found more practical.

BEES ARE KEPT IN GLASS HIVE TO STUDY THEIR HABITS

Investigators at the Smithsonian Institution and visitors are able to watch how bees build their combs and store honey, for the swarm is housed in a glass hive which permits a close view of them at work. The 40,000 members of the colony go about their duties in apparent disregard of spectators. A glass chute leads to the food supplies outdoors and a ventilating system for the hive is provided.

Bee Colony in Glass Home; the Chute at the Right Leads Outdoors; Traffic Rules Were Soon Enforced



Proof That Santa Does Not Forget Ship Passengers; How He Got over the Top Is a Mystery

STEEPLEJACK AS SANTA CLAUS CLIMBS LINER'S FUNNEL

Being far at sea does not prevent ship crews and passengers from observing Christmas in the traditional manner. The massive smokestack of the steamer "Arundel Castle" tested Santa's ability as a climber, but the accompanying photograph indicates that he arrived safely with his pack of presents.

PHONE AMPLIFIER IN SUBWAYS AIDS IN CALLING STATIONS

Guards in a New York subway are able to make themselves heard in announcing the stations, in spite of the roar of the trains, by speaking through an amplifying telephone arrangement. The transmitter is plugged into a slot conveniently placed, and the voice, greatly clarified and strengthened, comes out through receivers concealed in the roof of the car near the doors. Talking in an ordinary tone, the guard can be heard in all parts of the car and even on the station platform.

The LATEST

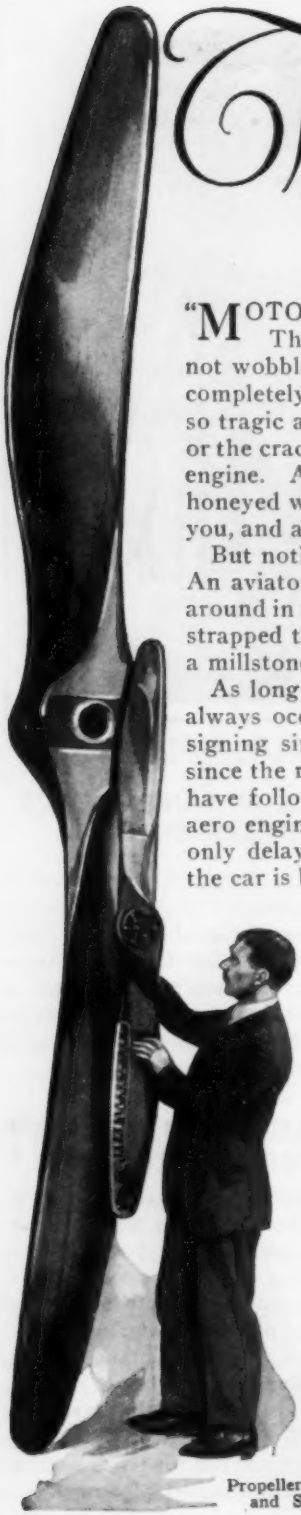
By CORLEY McDARMENT

"MOTOR trouble!"

There lives no pilot so hardened to air work that his heart does not wobble just a little when the splutter of a gasping engine dies out completely and leaves him alone in the silence of space. No silence is so tragic as that of a dead airplane motor. The snap of a control wire or the crack of a wing spar cannot give a thrill like the death rattle of an engine. A motor literally talks to an aviator. Its steady hum is like honeyed words of good cheer, saying, "Be not afraid; I'm up here with you, and all's well."

But nothing on earth or above it is more useless than a dead engine. An aviator with a silent engine is just an unfortunate mortal floating around in the clouds with a seven or eight-hundred-pound chunk of iron strapped to himself, and it is like being in the middle of the ocean with a millstone tied to the left ankle.

As long as motors are as complicated as they are today, trouble will always occur. Much time, money and genius have been spent on designing simpler gas engines since the advent of the automobile, and since the rise of aviation, costly designs, born of experimental research, have followed one another feverishly in attempts to build a fool-proof aero engine. An auto engine may quit at any time, but the motorist is only delayed in his journey and can often rest beside the road while the car is being repaired. But an aviator's journey is too apt to be ended, sometimes forever, by the simple failure of an engine part.



Propellers of Large Bomber and Small Sport Plane

If such troubles could be eliminated, it is estimated that the cost of commercial flying would be cut at least eighty-five per cent. The failure of a motor with the resulting "forced landing" so often costs the value of a whole airplane. One stump or a sapling can turn a $50,000 airplane into a piece of junk. A pilot seldom is compelled to meet with stumps or saplings if his motor is working. Of thirty-five fatal airplane wrecks which took place in the U. S. Army Air Service, where more flying was done than anywhere else last year, eleven were known to be from motor failures.

A pilot who lives through an accident never says "motor trouble," except to the uninitiated, but he more often says: "I threw a 'con' rod," "my oil line broke," "the gas line clogged," or "lost my water." He seldom says "ignition trouble," but is more specific with such as, "broken distributor finger," "a short from the battery," or "the wire to number twelve cylinder came off."

Parachutes have done much to help locate specific causes of engine failure, especially when fire breaks out. As an example of a thrilling escape from a burning plane when a piston breaks, the following, taken from the official report of an aviator, who

Engines of the Sky

Tandem-Engine Mounting on a Huge Seaplane, with Two Four-Bladed Propellers, One Being Used to Pull and the Other to Push; This Ship Was Used in the Flight to Hawaii

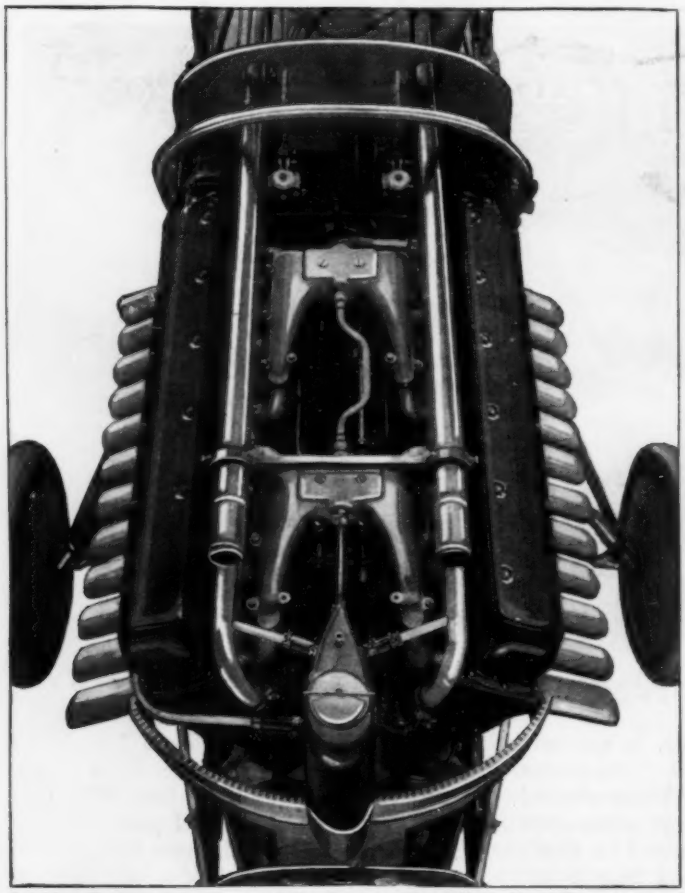
jumped over Lake St. Clair, is quoted:

"I took off about 8:55 a.m. The motor spluttered as usual until the plane cleared the ground; then with motor wide open and running perfectly, I started to climb to join the formation, which was about one mile east of the field at about 1,000 feet. Just before getting in formation, they did a ninety-degree turn to the south. I banked around to join them and, as I did this, a lot of steam came back into my face clouding my goggles. I looked at the temperature gauge and it was about seventy-five. I opened the shutters and throttled down a little. Then I noticed a tin-pan noise in the engine, as if it was greatly overheating. The formation then did a 180-degree turn and I pulled around to fall in and, as I did, more steam came into my face and I noticed a lot of smoke coming from the front lower part of the cockpit. I immediately put the machine in a dive, intending to land.

Tiny Two-Cylinder Engine for a Light Sport Plane; It Develops Twenty-Five to Thirty Horsepower

"As I pitched over into the dive, the front lower part of the cockpit seemed to burst into flames. The flames started licking me in the face, and knowing I was not very high and unable to see anything because my goggles were covered with steam and smoke, and also as the entire front part of the cockpit was in flames, I undid my belt, took off my gloves, stood up in the seat and dived over the left side of the fuselage. I pulled the rip cord and the parachute opened, and, shortly before I hit, I saw the plane strike, nose first, and I landed about 150 feet away."

Now, in this particular case, after the plane and motor were fished out and a board of officers examined the wreck, the conclusion was drawn that the fire was caused from a flash igniting the gasoline and fabric on the left side of the fuselage.



Looking Down on the Motor of the Curtiss "Hawk," an Army Pursuit Plane Noted for Its High Speed and Fast Climbing Ability

The flash was caused by a piston disintegrating, allowing the top end of the connecting rod to become free, which tore the cylinder walls and water jacket from bottom to top. This, in turn, caused the connecting rod on the opposite side to break. All this broke the crankcase and gasoline line between the two carburetors.

Such an accident is not one that can be remedied by airplane designers, and it does not directly concern motor designers; it is rather a problem of obtaining better metals. A metal lighter than cork and stronger than steel has been predicted for air use. Also, planes are now being designed with half a dozen motors, while flight can continue on two or three.

Of course, putting several engines in a plane is only beating the devil around the bush, so far as making engines fool-proof and reliable is concerned, but it certainly does prevent the forced landings, and it is these that do the damage.

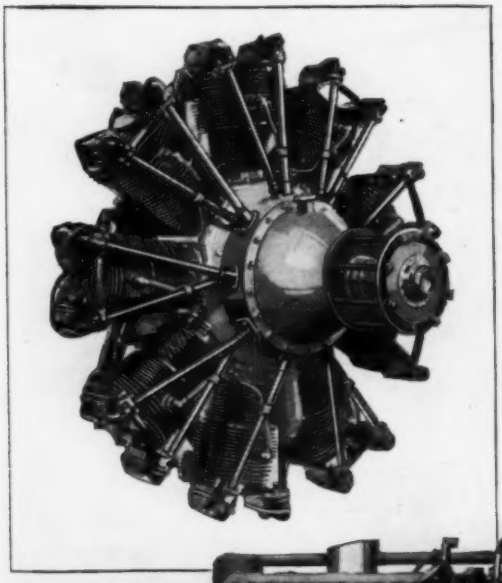
Ignition trouble used to be the big factor in engine failure, but with the generator systems, multiple magnetos and spark plugs that are uncanny in reliability, this menace has subsided somewhat. At present, there is less trouble with ignition than anything else. This is because it was once such a bother and hazard, and engineers set to work to overcome it, succeeding to a flattering degree.

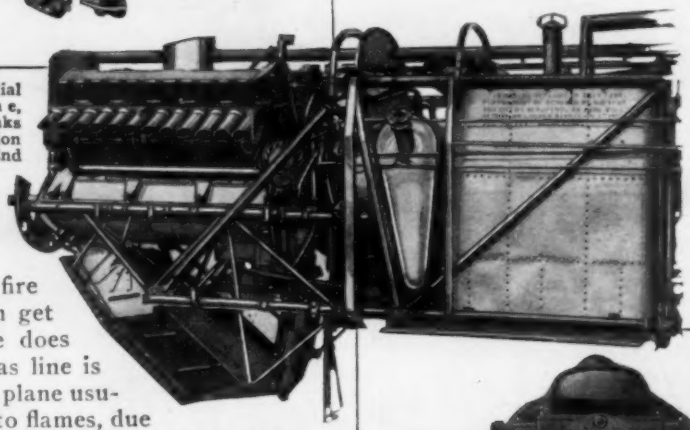
Some of the more common causes of motor trouble are loss of water, oil, gas or breakage. Airplane motors run at such high speeds, and, during maneuvers, they are subjected to all sorts of centrifugal action. Great care has to be taken to keep the gyroscopic effect at the minimum, otherwise a motor could wrench itself free from its bed or bearings.

Flexible water and gas lines have done much to eliminate loss of these liquids. But water, oil and gas are still lost in flight. The water hazard is being overcome in the latest engines by doing away with it entirely. The radial, air-cooled aero motor is gaining in popularity every day, and it is predicted that it will completely supplant the water-cooled type. Besides, it is much lighter in weight.

Oil leads and holes are being made as large as is dared to prevent stoppage of the flow, but losing oil is far too common, and it is very serious. Zero oil pressure forced Lieut. Leigh Wade down in the North Sea on his flight between England and Iceland during the world flight. Oil can probably never be discarded as water has been, and the system is far from perfect. Loss of oil is more serious to a pilot than even the loss of gasoline, because the

SOME OF THE PLANES NOW BEING BUILT IN THE U. S.





Air-Cooled Radial Engine; Engine, Radiator and Tanks of an Observation Plane; Bottom, End View of an Inverted Motor

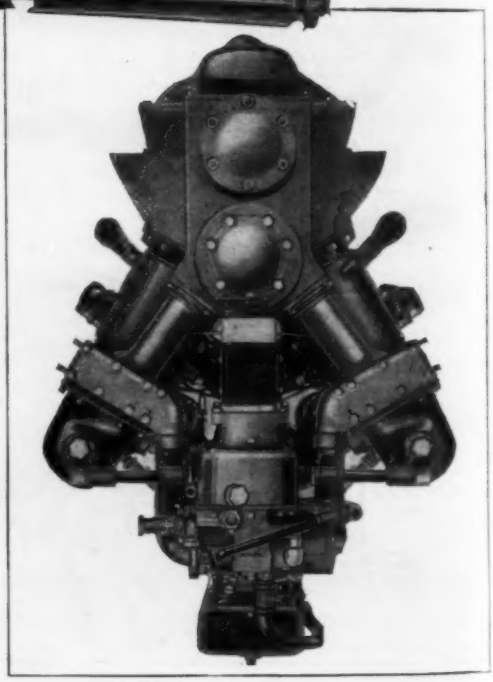
engine overheats and often catches fire before he can get down. If he does land and a gas line is ruptured, the plane usually bursts into flames, due to the gas touching the hot engine.

Insuring absolute gas supply to the cylinders is still a puzzle to designers. Gas lines frequently clog up even though the gasoline is strained through chamois skin. Pieces of solder from inside the gas tanks have caused clogging. The famous attempt of Hawker to fly across the Atlantic in 1919 was cut short in mid-ocean by this little thing.

As to whether the gravity or pressure feed is the best and most practical for the gasoline system is debatable. With gravity feed, the gas must be carried in the upper wing, or at least up where it affects the stability of the machine. The usual practice is to have the main tanks under pressure feed, and an emergency tank in the upper wing. Pilots always are expecting the gasoline pumps to quit, and they are not disappointed. Whenever an engine stops in the air, and the pilot does not know what the trouble is, he automatically switches to the emergency gravity gas tank.

Another significant thing about motor failures is seen in the annual report of major accidents in the Army Air Service during the past year. Of 343 wrecks that were total, or so close to it that it makes little difference, 103 were caused by motor trouble. The other accidents ranged from sheer bad luck to just bone-headed flying. One crash was due to the pilot's attempting to show off before a crowd. In another case a cadet on his first solo flight, wandered over to a creek where some other boys were fishing and he got so interested that he forgot what he was doing and hooked a wing in a tree.

But the hazards of the air are constantly being reduced, and during the last summer



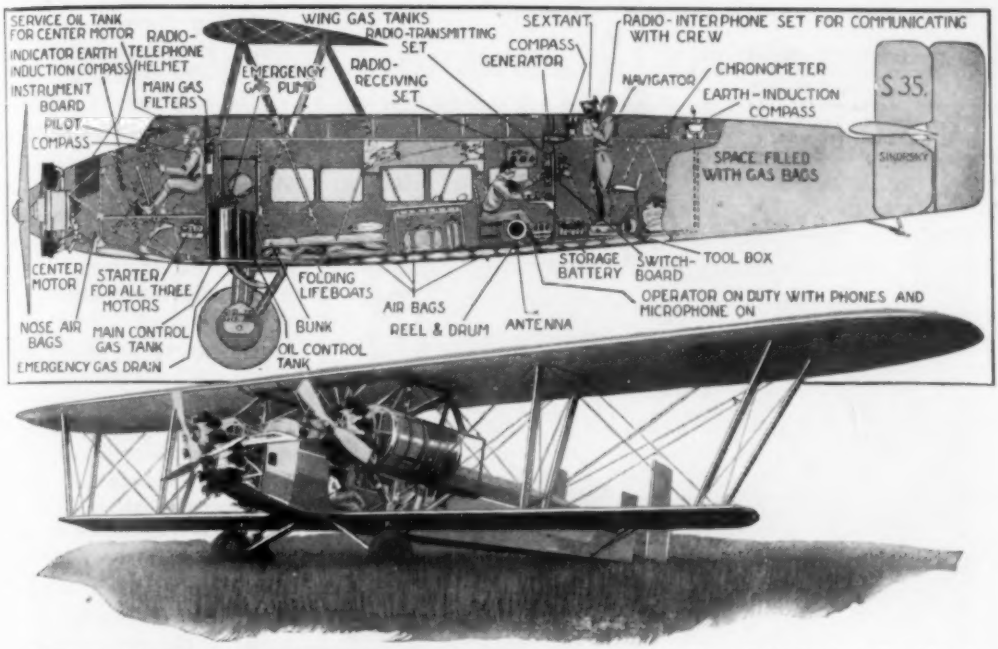


Photo and Diagram, Showing the Interior Arrangements of a Typical Big Plane; This Is Rene Fonck's Ill-Fated Three-Motored Sikorsky, Which He Hoped to Fly from New York to Paris

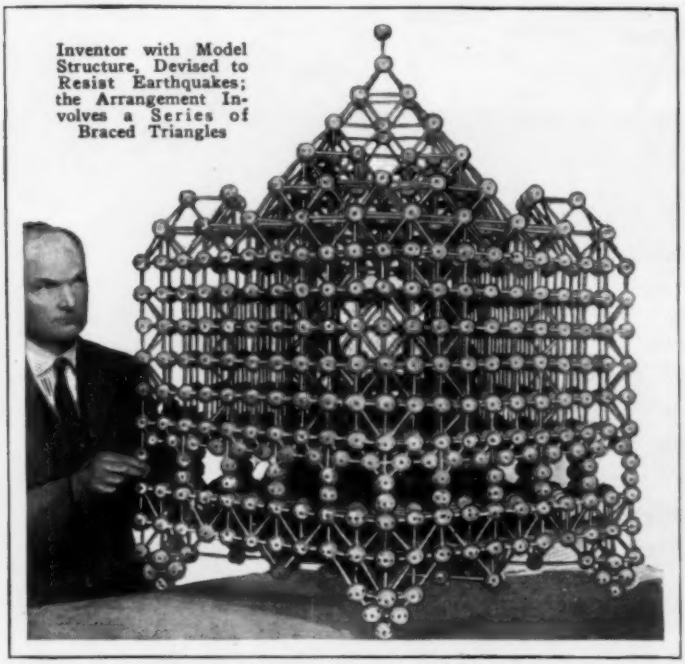
ten extensions of the air mail totaling 4,000 miles in length were put in operation, all financed by private capital. Many of these lines will provide passenger service in addition to carrying the mails.

Three individuals or concerns stand out in this hopeful development of commercial aeronautics, for the first time divorced from the spectacular flying of military machines and foolhardy showmen. First is Henry Ford. He has built a model airport at Dearborn. He has taken over the Stout metal-airplane factory and incorporated it in his own vast industrial enterprise. He is helping to finance the Aircraft Development Corporation, a group of aeronautic engineers seeking to perfect an all-metal dirigible airship.

National Air Transport, Incorporated, has a capital of $10,000,000. Its members include such figures as Howard Coffin, of Liberty engine fame, and such names as Rockefeller, Davidson, Wrigley and Lamont. Col. Paul Henderson, who as second assistant postmaster-general perfected the illuminated airway for night flying and inaugurated the first through transcontinental service of the air mail, is general manager. The NAT is operating the 1,000-mile extension of the air mail from Dallas to Chicago and it is also ready to take over the United States Air Mail, including the Chicago-New York service.

One of the most interesting figures in aviation today is a twenty-nine-year-old youth, Sherman M. Fairchild. Nine years ago at the age of twenty Mr. Fairchild was awarded a contract to build an aerial camera for the government. He built such a remarkable picture box that it became the official camera of the United States Army, Navy and Marine Corps, the Canadian, Brazilian and Japanese governments. In the face of skepticism from noted engineers, Mr. Fairchild took his camera and put it to work in civil use.

Mr. Fairchild, who is himself a pilot and aeronautical engineer, has designed a cabin monoplane with air-cooled engine which will retail at somewhere around $4,000. He believes that the element of safety lies primarily in frequent and commodious landing fields and he is confident that private enterprise will develop such fields as the air becomes populated, just as the filling station and garage grew to meet the demand of the automobile. He insists that it is far easier to make a pilot of the family chauffeur than it was to make a chauffeur of the family coachman.



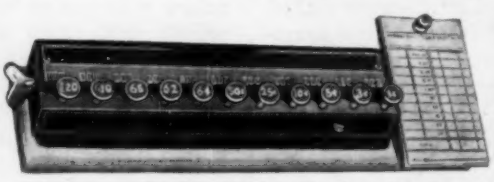
Inventor with Model Structure, Devised to Resist Earthquakes; the Arrangement Involves a Series of Braced Triangles

NEW METHOD OF CONSTRUCTION TO RESIST EARTHQUAKES

Patterned after a system of building practiced by the ancients, a type of construction devised by a western inventor is intended to afford a means for erecting hotels, houses and other structures that will withstand earthquake shocks. A model of his plan shows a group of central supporting units braced by connecting props arranged in geometrical fashion.

COIN TABULATOR AND CHECKER HELPS MAKE UP PAYROLL

Preparing money for the pay envelopes is often a laborious task, especially when the sums involve odd amounts. To simplify the work, a tabulator with keys that register different denominations from a nickel up to $20, shows the number of coins and bills of different kinds that will be needed for the entire payroll. With a little practice, a sum such as $17.35, for instance, could be registered in but two operations. Pressing three keys at once would tabulate a $10, a $5 and a $2 bill while two others in the cents column would register the quarter and the dime necessary to make up the total. When the payroll is completed, a quick computation checks its correctness.



Tabulator to Simplify Making Up Payrolls; Pressing Keys Registers Number of Coins Needed

QUEEN OF FLOWERS

Although the rose is popularly regarded as the queen of blossoms, the botanist awards this distinction to the lowly daisy because of its structure. It represents about 250 flowers or florets with complicated arrangement of stamens and pistils, while the handsome rose is much simpler, its petals being the showy garb of a flower in an early stage of development. The small rays of the daisy are not petals but whole flowers in themselves and the yellow boss also consists of individual flowers.

SURGICAL OPERATIONS ON FISH

Most aquariums today have hospital tanks where sick fish are treated. Sea-water baths have been found beneficial to fresh-water fish when they become sick and sea fish are often greatly benefited by the fresh-water cure. A very serious affair is a puncture of the swimming bladder. This may be caused by taking the fish too suddenly out of water. It swallows a draft of air without having previously expelled the liquid contained in the bladder. For this operation, the fish is placed on an inclined plane so that the head remains under water. A gentle massage is applied around the gills to expel the air. If this does not suffice, the surgeon punctures the bladder with a needle.

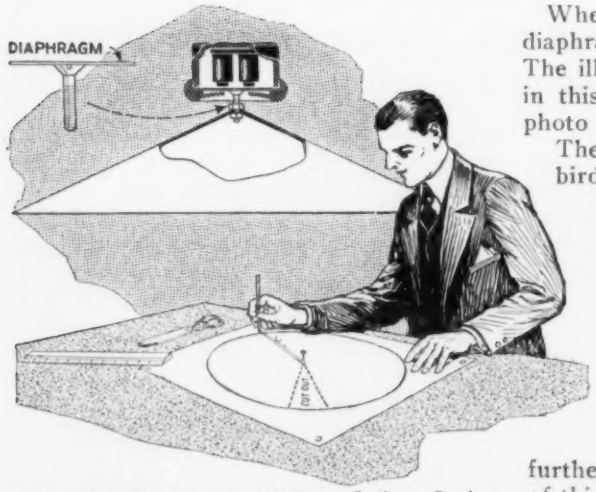
Inexpensive Homemade Cone Speaker

By WALTER E. BURTON

THE simple cone speaker shown in the photo, can be built by any radio experimenter for a few cents, and the tone qualities will prove a revelation when compared with the average horn speaker. The parts required are to be found in the average radio owner's equipment, as almost any type of horn unit will be suitable. A headphone of high resistance can be used, but a unit of the type designed for a phonograph or horn would be better as it will require the least changing.

The cone is of the free-edge type; that is, the vibrating member is supported in the center. The cone itself is made of heavy paper or cover stock, or lamp-shade parchment may be used and decorated if desired, adding much to the appearance of the cone. The material should not be too heavy, but should possess enough strength to maintain its shape. The paper or parchment is laid out on a table and pinned to it in the exact center. A loop of string is placed over the pin, and a pencil placed in the other end of the loop. This loop of string acts as a guide when describing the circle. The circle should be 2 or 3 in. larger in diameter than the finished cone. A triangular segment is cut from the disk, the apex being at the geometrical center of the circle. The two edges of this section are then brought together, and glued with the aid of a narrow strip of the material, or they may be lapped and glued if preferred. The resulting cone will retain its shape indefinite-

Photo Shows Cone Speaker in Operation, Suspended from Art-Metal Bracket; the Drawings Indicate a Variety of Other Possible Mountings



Laying Out the Cone; Dotted Lines Indicate Section to Be Cut Out; Above, Diagram of Assembly

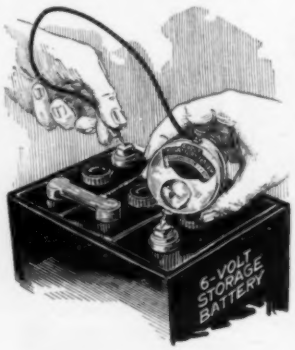
ly, unless subjected to severe strain. To further insure stability, the edges may be bound with a thin strip of metal, although this should not be necessary if the material is fairly heavy.

After completing the cone, prepare the diaphragm of the loud-speaker unit, so that a small flat-head brass machine screw, 1 in. long, can be soldered in the exact center of the diaphragm. The latter is usually coated with enamel, and a small area of this enamel must be scraped away so as to expose the metal for soldering. Be sure that the machine screw is exactly perpendicular to the diaphragm. The unit is then reassembled as shown in the sectional diagram, and is now ready for the cone. If the unit is of the type employing a mica diaphragm, the screw must be soldered or cemented to the central driving pin. Sealing wax may be used, but a soldered connection is better. The cone is fastened to the machine screw by means of two small brass nuts. A small hole, slightly less in diameter than the screw on the diaphragm, is made in the apex of the cone. One brass nut is threaded on the screw, the cone slipped in position and the remaining nut fastened on the inside of the cone, completing the assembly. The nuts should be screwed tightly in place, to prevent any slight movement that would interfere with the vibration of the diaphragm. If the unit is of the adjustable type, it may be regulated while in use, to obtain best results.

When assembled, the unit is suspended, diaphragm down, from a suitable support. The illustrations give several suggestions in this respect, the support used in the photo being a small art metal bracket. The sketch at left shows the use of a bird-cage stand, and the others adaptations to light fixture and bridge-lamp stand. Any one of these makes a neat appearance, and if the cone is decorated, adds much to the appearance of the room. The strings passing over the unit terminate in small metal hooks at the edge of the cone, and are suggested to prevent the cone from swaying in air currents, and to further stabilize the assembly. A speaker of this type gives excellent results, reproducing voice and music with a full round tone and bringing out more of the low notes so often absent in horn speakers.

Pocket-Type Charge Indicator

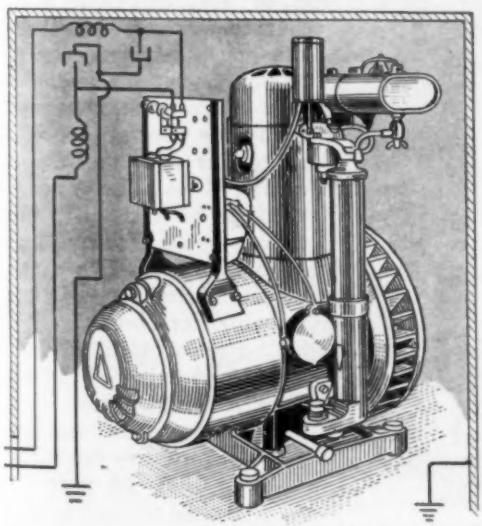
The pocket-type charge indicator shown in the illustration is about the size of the standard pocket voltmeter, and is now available for testing storage A-batteries of the 6-volt type. The direct-reading scale indicates when to start charging, when the charge is sufficient and when the battery should be taken off charge. The instrument is useful for checking storage batteries in console sets where space is limited, and does away with the danger of spilling acid as in tests with a hydrometer.



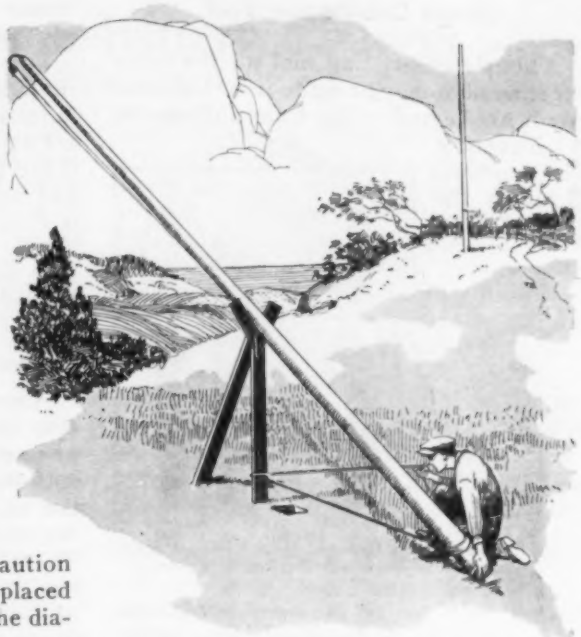
Getting Rid of Lighting-Plant Interference

Lighting-plant interference is caused by the ignition system or by sparking at the brushes. One remedy suggested is to try a piece of flexible metal tubing over the high-tension wire which runs from the spark coil to the spark plug. This

metal covering should stop about ½ in. from the terminal and then be taped to prevent sliding along the wire and touching the terminal. The tubing also should be grounded (never to the frame of the lighting plant) by a wire carefully soldered to it and then connected to an iron rod, 6 ft. or so long, driven into the ground. If the trouble is caused by sparking at the brushes, this may be remedied by condensers, those from Ford coils being usable. Two of these should be connected in series across the line which goes from the lighting plant to the battery and house wiring, as shown in the illustration. The center point of the condensers is then grounded to an iron bar driven in the earth. A further precaution would be the use of inductance coils placed in the line in the manner shown in the diagram; these coils may be wound on a tube, 2 in. in diameter and 3 in. long, putting about 150 turns in each coil. The coil wire should be about the size of that going from the lighting plant to the battery. If these methods fail, as a last resort it might be well to cover the entire lighting plant with a metal shield, which should be grounded. The shield will prevent the plant wiring from acting like an aerial and transmitting interfering waves.



Lighting Plant, Showing Suggested Methods of Eliminating Radio Interference



Aerial Mast Resting in Crotch, Ready to Be Raised

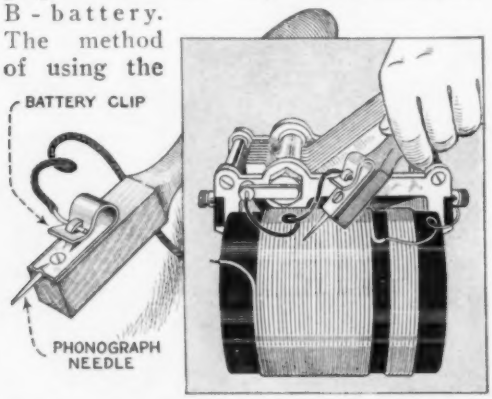
Tip on Raising Aerial Masts

Being confronted with the problem of raising two long and unwieldy aerial masts without assistance, I successfully employed the method indicated in the illustration after several others had failed. A 10-ft. post was sunk in the ground near the hole for the mast, well braced at the rear, and to its top were nailed two short pieces of scantling, forming a "Y." The small end of the pole was then laid in this crotch, a rope securely fastened near the butt end of the pole, and the rope looped around the post, near the ground, as shown, the loose end being held in the hand. By sliding the pole in the crotch, with the butt close to the ground, the snubbing effect of the rope, held tight in the hand, prevented slipping, and the pole was gradually hoisted in position. The ease with which the job was done was surprising after the energy expended in trying to raise it by other means. The crotched post was then removed to the site of the other mast and the operation repeated.—Bonar W. Balfour, St. Catharines, Ontario, Canada.

Remove excess acid from the battery top with a cloth dampened with ammonia.

Simple Coil-Testing Tool

A simple coil-testing tool for the radio experimenter, may be made from a phonograph needle and a clip from a discarded B - battery. The method of using the tool for determining the number of turns necessary to bring in the stations at the proper places on the dial, is clearly shown in the illustration.



Details Showing Needle Mounted under Clip, and Right, Testing Coil to Determine Number of Turns

Homemade coils can be matched with whatever condenser the builder may have on hand; the coil is wound with what is known to be more than the necessary number of turns. One of its ends is connected to the stationary plates of the variable condenser, the other being left unconnected. The coil-testing tool is now connected to the rotor plates of the condenser, and the sharp point thrust through the insulation of the coil at various places, while a station of known wavelength is being tuned in. When a place on the coil is found where a station of high wavelength comes in at a relatively high point on the dial, the surplus wire is cut off. The end of the coil is then connected to the rotor of the condenser instead of the test tool; this does away with the usual cut-and-try method.

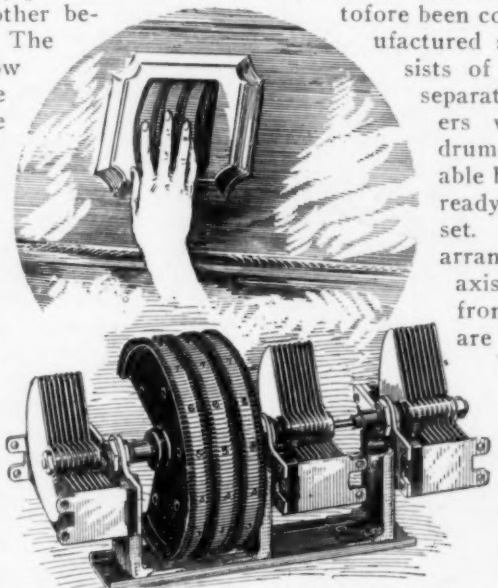
Two of these tools connected with a short length of wire will be found useful in testing doubtful soldered joints. They are set to straddle the joint to be tested; if the set works better through the tools and connecting wire, the soldered joint is defective. The writer finds a wooden handle is quite satisfactory, but bakelite may be used if desired.—L. M. Curtis, Venice, Calif.

New Condenser Has Bakelite Shaft

A new variable condenser has a shaft of clear bakelite instead of the common brass or steel type. The condenser is built into a U-shaped frame in such a manner that the shaft itself furnishes the insulation between the rotary and stationary plates. This design eliminates the side strips of insulating material and their supporting ribs, and permits the use of an all-metal frame that makes the condenser extremely compact and rigid.

Drum-Type Control Unit Available for Home Builder

Centralized control units of the drum type are now available for the radio builder; this method of control has heretofore been confined to a few manufactured sets. The unit consists of two, three, or four separate variable condensers with tuning-control drums mounted on a suitable bracket, complete and ready for insertion in the set. The condensers are arranged on a common axis to be parallel to the front panel. The drums are grouped between the first and second condensers, which are rigidly mounted on a supporting bracket. All condensers are independent, and the drums are grouped so that all may be moved at once by the fingers of one hand.



Drum-Type Control Unit, Showing Condensers in Parallel, Which Can Be Controlled with One Hand

Simple Tungar Battery Charger

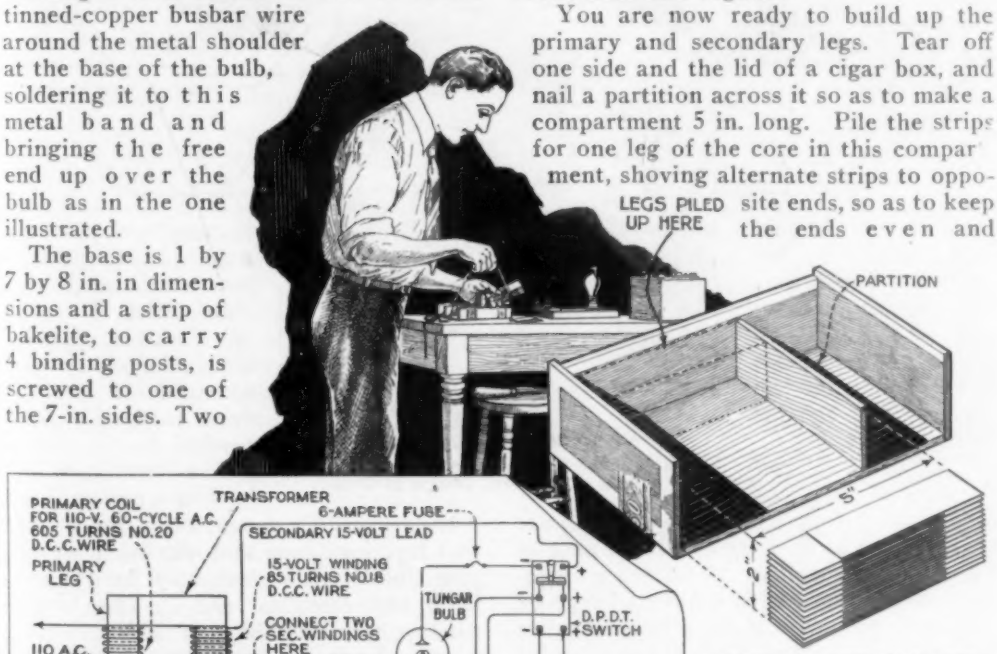
By F. L. BRITTIN

TUNGAR battery chargers are quiet, contain no liquid to spill, and have no vibrating elements to get out of order. They are always ready for duty and operate at low cost. While there are a number of good chargers of this type on the market, many experimenters prefer to build their own, saving a few dollars and at the same time gaining useful experience.

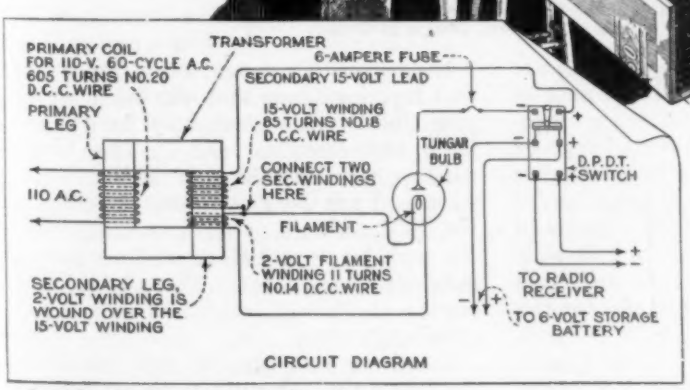
The instrument consists of a hardwood base, a socket of the standard porcelain type, a 2-amp. tungar bulb, and a two-voltage transformer. The bulb is the most expensive part of the instrument and retails for $4. When purchasing it specify the type having the external anode connection coming up over the top of the bulb. If this type is not available, it is a simple matter to add the connection by winding a turn or two of No. 14 round tinned-copper busbar wire around the metal shoulder at the base of the bulb, soldering it to this metal band and bringing the free end up over the bulb as in the one illustrated.

The base is 1 by 7 by 8 in. in dimensions and a strip of bakelite, to carry 4 binding posts, is screwed to one of the 7-in. sides. Two posts are for the output to the storage battery and the other two for the 110-volt 60-cycle a.c. supply. The transformer is wound to furnish 2 volts for lighting the filament of the bulb, in addition to the 15 volts to be rectified for the battery. The secondary of this step-down transformer therefore has two windings, one carrying 10 amp. at 2 volts, the other 2 amp. at 15 volts. Black stovepipe iron is used for the core laminations, and should be of such thickness that 58 laminations, including the shellac used for binding, will make a pile 1 in. high. The iron is cut into 1¼ by 3¾-in. strips with heavy tinsnips and piled to make a hollow square, 5 in. on a side, the ends of alternate strips overlapping 1¼ in. Any ragged edges on the strips should be trimmed off so that the core looks neat and regular.

You are now ready to build up the primary and secondary legs. Tear off one side and the lid of a cigar box, and nail a partition across it so as to make a compartment 5 in. long. Pile the strips for one leg of the core in this compartment, shoving alternate strips to opposite ends, so as to keep the ends even and square. As each strip is laid in, coat it with shellac, and when the pile is 2 in. high, place a wooden block on it and clamp



METHOD OF ASSEMBLING CORE


PRIMARY COIL FOR 110-V. 60-CYCLE A.C. 605 TURNS NO.20 D.C.C. WIRE
TRANSFORMER
6-AMPERE FUSE
SECONDARY 15-VOLT LEAD
PRIMARY LEG
15-VOLT WINDING 85 TURNS NO.18 D.C.C. WIRE
TUNGAR BULB
D.P.D.T. SWITCH
CONNECT TWO SEC. WINDINGS HERE
110 A.C.
FILAMENT
2-VOLT FILAMENT WINDING 11 TURNS NO.14 D.C.C. WIRE
SECONDARY LEG, 2-VOLT WINDING IS WOUND OVER THE 15-VOLT WINDING
TO RADIO RECEIVER
TO 6-VOLT STORAGE BATTERY

CIRCUIT DIAGRAM

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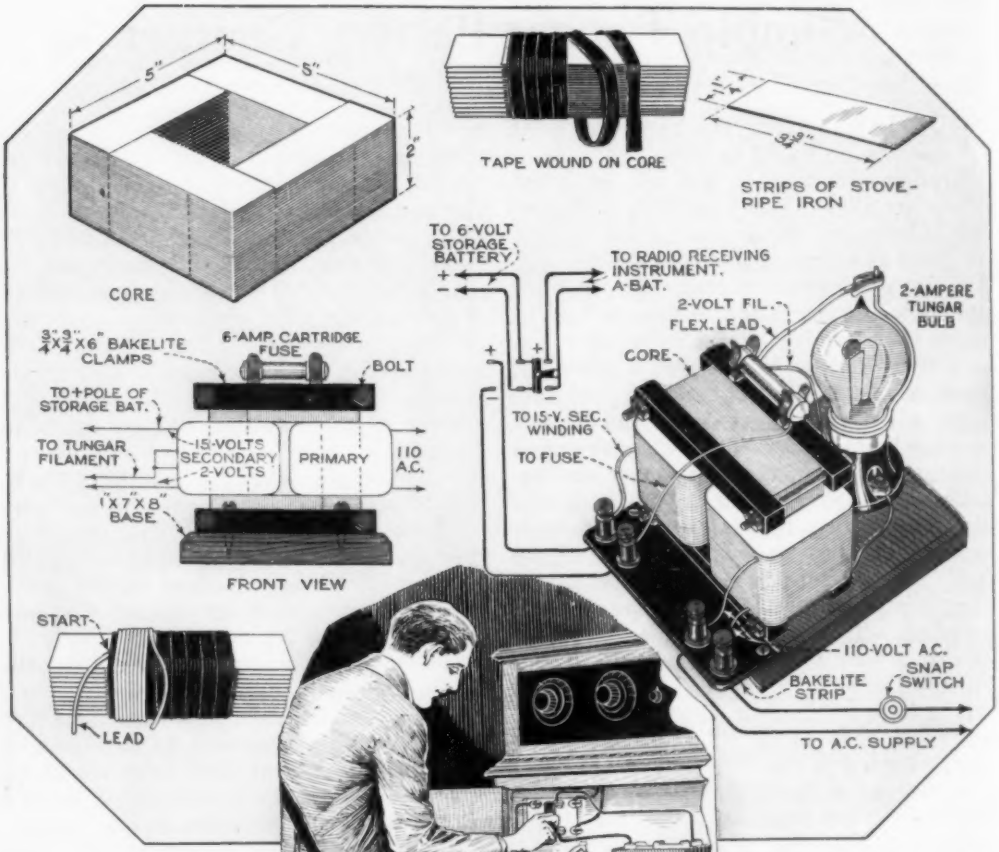


Details of Home Charger; Completed Instrument with Wiring and, Below, Charger in Console

until dry. When dry, remove the leg and bind it with friction tape in the manner shown. Two legs are made in this manner, one for the primary and one for the secondary.

The primary coil consists of 605 turns of No. 20 d.c.c. wire. If any splices are required, make them as small and neat as possible and carefully solder the connection, insulating it with a piece of tape or spaghetti tubing. Leave a long starting end on the coil and bind it down under the first layer of turns to hold it firmly in position. Coat each layer of the coil, as it is wound, with shellac; if desired, two wooden spool ends may be made for the leg to facilitate even winding of the coil. Leave plenty of wire at the start and finish of the coil for leads. After the winding is completed, place the coil in a moderately hot oven and bake slowly and thoroughly. This baking process is important and should be carefully done to insure good results.

The secondary coil is then wound on the other leg, which should be wrapped with two layers of tape and one layer of empire cloth. This cloth may be obtained from any electrical shop. The 15-volt winding consists of 85 turns of No. 18 d.c.c. wire, and the 2-volt winding, 11 turns of No. 14 d.c.c. wire, is made over it. Shellac each layer as before, and leave long ends for connections. This coil is thoroughly shellacked, and then baked until completely dry.

Stand the two legs on end, and insert the side strips or laminations at one end,

then reverse and fill in the other end. Coat the entire assembly with shellac, and dry thoroughly. The top and bottom ends of the core should be clamped to prevent humming. To do this, use either regular iron transformer clamps, obtainable from electrical-supply firms, or the method shown in the illustrations. The clamps consist of four bakelite strips, ¾ by ¾ by 6½ in., which are bolted to the transformer, the lower ones being also screwed to the base, to support the assembly. One of the top strips serves as a support for a 6-amp. cartridge fuse, one end of which is connected to the anode terminal at the top of the bulb by means of a flexible wire terminating in a Fahnestock clip, and the other to the negative battery binding post on the base. Join the secondary coils, as indicated in the wiring diagram, by a well soldered connection, then tape and shellac the joint. Screw the bulb socket in position, and connect the 2-volt secondary leads to the filament terminals. The supply for the primary of the transformer can be connected with lampcord to a plug and inserted in a wall socket. A snap switch is placed in one side of this line and may be mounted at any convenient point near the set or inside the console. The d.p.d.t. switch mounted in the console is of the common porcelain-base type, and may be mounted at any convenient point. The 6-volt storage battery leads go to the center posts or "knife" of the switch. The charger leads go to one end, and the other end to the leads for the A-battery connections in the set. When wiring this switch, be careful to have all positive and negative posts connected just as shown in the diagram.

To operate the charger, first see that all connections are correctly made and the tungar bulb in position, with the clip at the top in place. Throw the d.p.d.t. switch to connect the A-battery to the charger and turn on the snap switch in the 110-volt line. If the bulb does not glow when the current is turned on, turn off the current and disconnect the end of the 15-volt winding, where it is connected to the 2-volt coil, and connect it instead to the other end, that is, reverse the 2-volt connections. If the bulb still refuses to glow, it may be necessary to add one or two turns to the 2-volt winding, or five or six turns to the 15-volt winding, as the characteristics of the bulbs vary a little. When the instrument has been found satisfactory, solder the connections, and retape the coils. The ordinary 6-volt battery should be placed on charge overnight, and the charge continued through the following day, if the battery was low, until the hydrometer shows the correct reading. Keep the battery charged as near 1.280 as possible, and do not let the reading fall below 1.175 before recharging. Never charge a battery by guess, always use a hydrometer or similar tester. For average use a 6-volt 80-amp.-hr. radio battery will require recharging every week or ten days. This tungar charger is not designed to give a high charging rate, as it is always best to charge radio batteries slowly. Do not put the charger in a box, away from the air; if it is placed in a console, open the doors of the cabinet while charging to provide good circulation.

MATERIAL LIST

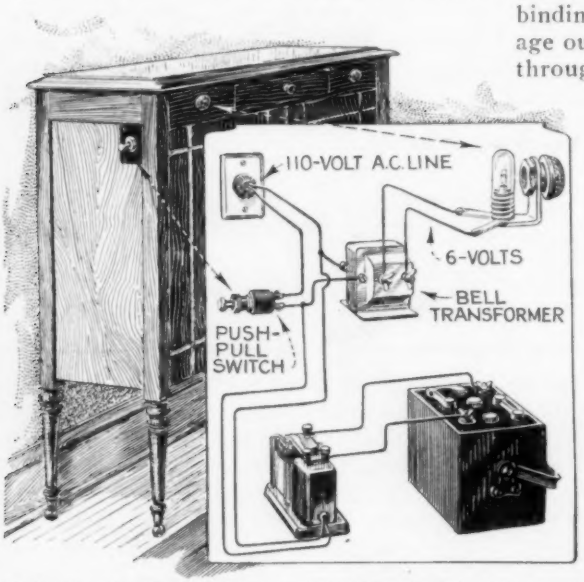
1 hardwood base, 1 by 7 by 8 in.
4 binding posts.
1 6-amp. cartridge fuse, with mounting clips.
1 2-amp. tungar bulb.
1 porcelain socket.
1 strip bakelite, 3-16 by 2 by 7 in.
4 bakelite strips, ¾ by ¾ by 6½ in.
4 bolts, 4½ in. long, with nuts to fit.
1½ lb. No. 20 d.c.c. magnet wire.
½ lb. No. 18 d.c.c. magnet wire.
10 ft. No. 14 d.c.c. magnet wire.
1 large roll electrical friction tape.
1 empty cigar box.
1 d.p.d.t. switch.
1 snap switch.
10 ft. lampcord with wall-socket plug.
1 piece empire cloth, 2½ by 8 in.
Stovepipe iron, wood screws, and shellac.

Testing Insulating Materials

Losses occurring in panel material, cabinets, baseboards and forms used in winding coils may be detected by placing the material between two r.f. coils in the set when the set is in operation and noting the variation in signal strength. If the insulating material is efficient, there will be no appreciable difference in this respect.

Pilot Light for Battery Charger

The pilot light shown in the sketch is a visual reminder that the A-battery is on charge; in these days of silent chargers, one is likely to forget the charger is working. While this installation is intended for console cabinets, where provision is made for housing the storage battery, charger and B-batteries within the cabinet, it can also be adapted for use where the storage battery is placed in the basement. The materials required are usually to be found around the average workshop, or may be purchased from any radio dealer. The transformer is of the step-down type commonly used for doorbells, and must have a low-voltage tap of 6 volts. The push-pull switch is of the kind used for the A-battery supply on radio sets; and the small 6-volt lamp and bracket with colored glass bull's-eye is of the standard radio-panel type. This pilot lamp is mounted on the panel or cabinet so that it will be in plain view.



Radio Console, Showing Suggested Positions for Pilot Lamp and Switch; Insert, Detailed Wiring Diagram

The switch is located conveniently either on the panel, or on the cabinet, in which case a hole slightly larger than required on the panel must be drilled in the cabinet. A small strip of bakelite is then drilled for mounting the switch, and screwed to the cabinet with the switch in place. The step-down transformer is located inside the cabinet near the top, where it will be out of the way. Most of these transformers have two No. 14 insulated wires, about 6 in. long, for connecting to the 110-volt 60-cycle line. Lugs should be soldered to these leads, and binding posts provided for the low-voltage output. The supply line is brought in through the rear of the cabinet and should pass through a short porcelain insulator. The lamp cord used should be long enough to reach a convenient baseboard receptacle, and an attachment plug is attached to the far end. The end of the cord inside the cabinet is bared of insulation for the length required to make connections, and a small lug is soldered to one of these ends. As chargers usually come with cord and plug attached, cut off the plug and leave just enough cord to make connections, then solder lugs to the ends of this cord. To make the connections, the wire having the lug, coming from the 110-volt line, one wire from the charger and one wire from the transformer are brought together and held by means of a short brass machine screw thrust through the lugs and kept in place by a brass nut. A lock washer may be used to insure a tight permanent connection if desired. The remaining wire from the cord supplying the 110-volts is connected to one side of the push-pull switch; from the other terminal of the switch, a short flexible lead, terminating in a lug, is run to the transformer. The remaining lead from the charger is also connected to this lead from the switch. Finally connect the leads from the 6-volt terminals of the transformer to the pilot-light terminals, and the installation is complete. Make sure that all connections are tight, and wrap them with a double layer of friction tape. In operation, when the switch is in the on position, the charger is working and the pilot is lighted. In this way the charger may be left permanently connected, and a glance at the illuminated disk in the cabinet will suffice to tell whether the charger is in the circuit or not.—W. J. Langan, Freeport, Ill.

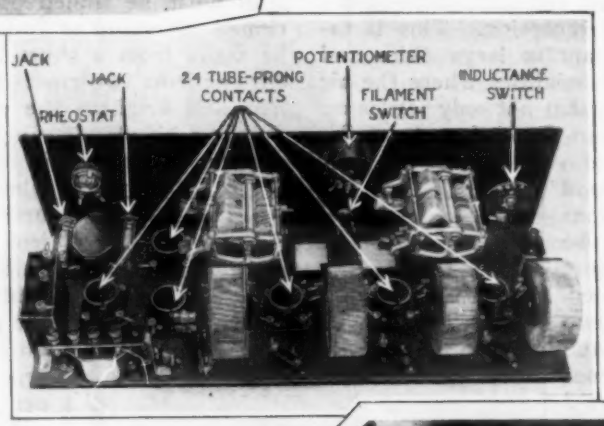
CLEAN CONTACTS MEAN CLEAR RECEPTION

By IRA V. KELLER

ALL electrical contacts in a radio set must be clean, and kept so to insure good continuous reception. This is increasingly important in large cities and in manufacturing localities where the air is filled with soot, that not only settles on the aerial but filters into all parts of the set. One cardinal virtue of every well-built receiver is good soldered connections and these must be pefectly clean before the solder is applied. Merely butting two wires together and applying solder does not make a good joint; the connection must be mechanically strong enough to hold, even though solder were not used. The solder insures a permanent connection but does not itself make it.

Before proceeding further, it is well to know just what constitutes a well-soldered joint and how to make one. First, the iron preferably should be of the small electrical type if possible, although good work can be done with a plain one, heated by means of a blowtorch or gas stove. Second, the iron must be tinned properly and kept tinned. A stand or rest for the iron can be made from a short length of busbar wire or from two crossed nails. Heat the iron and brighten the point with a file. Spread a bit of soldering paste on a sheet of copper, brass or tin that has been polished, and rub the bright point of the iron over the fluxed surface. Solid wire solder is applied to the point of the iron during this rubbing process in the manner shown. This will coat the point with a layer of solder if the iron has been brought to the proper temperature, and this tinned surface must be maintained while the iron is in use. Electric irons are automatically heated to the proper temperature, but if the plain iron is used, care should be taken not to overheat it, or the tinned surface will be burned off. The quality and kind of flux used are important in wiring a radio set. Rosin-core solder, or solder of the

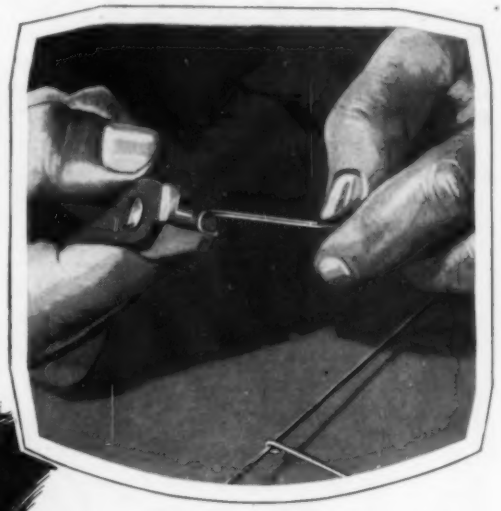
Top, Filing Tip of Soldering Iron; Center, Arrows Point to Contacts That Cannot Be Soldered; Bottom, Tinning Iron

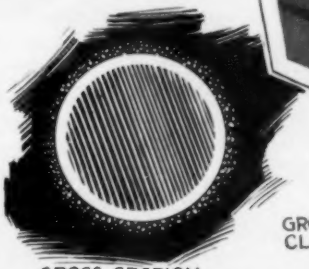


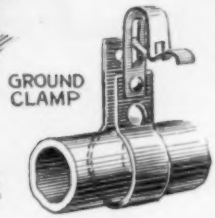
acid-core type, is to be avoided. The former will run under the connections and cause poor contact and the latter will corrode. A simple soldering paste, obtainable from any hardware or radio dealer, is preferable and should be used sparingly; a minute bit of the paste is applied to the surface to be soldered and then wiped off with the finger, as a very light film is all that is required. Anyone who has tried to solder a joint without using flux of some kind will know from experience that the molten solder will stubbornly roll off the wire unless some type of flux is used. The paste itself does not make the solder adhere, but it does remove an agent which otherwise would prevent the soft metal from sticking. This agent is an oxide, formed by the contact of the hot iron with the wire, so that the solder cannot reach the surface to be soldered, and is removed by the paste. Round tinned-copper busbar wire makes a neat job, and is easily bent with a pair of wire-forming pliers. When two wires are to be connected, form a loop on one as shown, and clamp it tightly over the other for a good mechanical joint, before applying the solder. At binding posts, soldering lugs should be used, and it is well to watch carefully that no flux runs under the lug, making a poor contact. If this is suspected, it is best to remove the binding post, and sandpaper the lug and the shoulder of the post to be sure of a good clean contact.

So much for soldering. Next in importance are those contacts that cannot be soldered, and these are numerous in any set. In fact there are from 25 to 30 such contacts in every five or six-tube set, and these are indicated by arrows on the photo of a six-tube set. Twenty-four are at the tube-prong contacts, and others at the jacks, switches and rheostats. Dirt on any one of these will be a fruitful source of noise, because many tubes have solder on

their base prongs, which rubs off on the socket contacts, oxidizes and forms a high-resistance, noisy connection. The battery switch will often accumulate dirt after continued use and should be taken apart and cleaned if possible; the same is true of the rheostats. Keep the tube prongs bright and shiny, cleaning both prongs on the tube, and the socket contacts also, with a bit of fine sandpaper. If the tube prongs are difficult to get at, use a pencil rubber; never use a coarse file or emery cloth. Spring contacts in jacks are treated with sandpaper in the same manner. The jack need not be removed from the set for cleaning, but care should be taken that the springs are not forced apart so as to prevent a good contact when the plug is inserted.

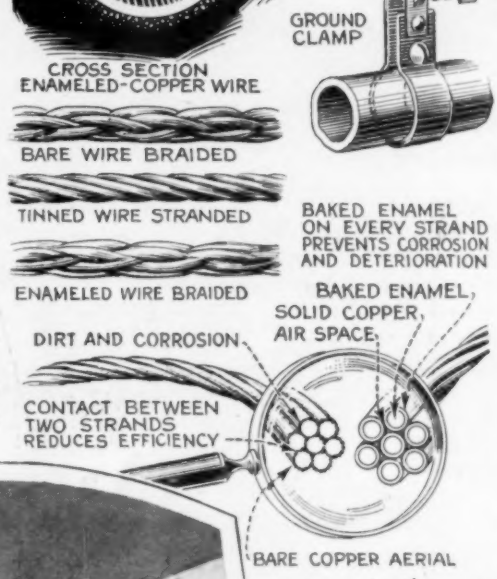


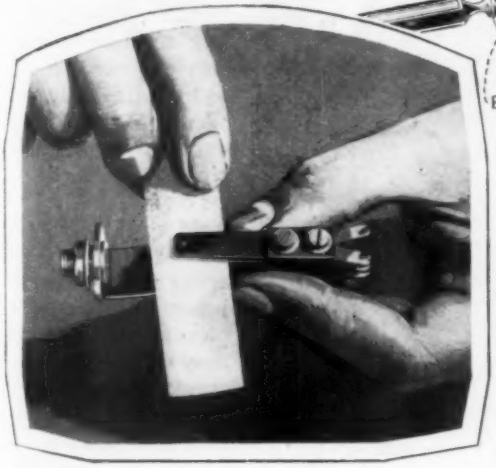




Above, Forming the Loop, Preparatory to Making Connections; Center, Ground Clamp and Aerial Wires; Bottom, Cleaning Jack Contacts

Next to be considered are the aerial and ground connections, where good, clean contacts are just as important as in the set. A ground clamp on a cold-water pipe is a general favorite, but the pipe should be filed bright before the clamp is applied. The aerial must have the least possible leakage and resistance to the currents sent out by the broadcasting station if long-distance reception is to be obtained. Experience has taught that enameled-copper wire makes an ideal aerial, several types of stranded aerial wire being shown in one of the illustrations. In the cross section of a strand of enameled-copper wire the white band on its circumference represents the enamel coating, while the small dots on the outside indicate dirt. The broadcast current penetrates through the dirt and enamel and travels on the surface of the copper wire, beneath the enamel. The copper, being a good conductor and free from dirt, permits the high-frequency radio wave to reach the instruments in the set, at its greatest possible strength. The magnified ends of plain stranded wire and of that covered with baked enamel, clearly illustrate the point. As the high-frequency radio current trav-

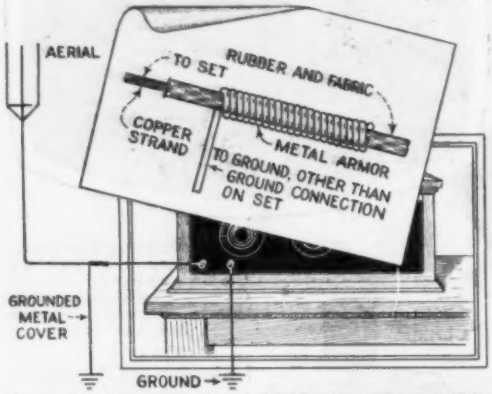




els mostly on the surface of the wire, a film of dirt and corrosion decreases the efficiency of the aerial by resisting the incoming current, which is very weak, even from local stations. It also allows current to leak to the ground instead of going to the instrument as it should.

Dirty insulators are another source of leakage, and must therefore be kept clean. This is easy to do with glazed or glass insulators, but they should be inspected at intervals to be sure there are no cracks that will accumulate dirt and form a path of escape.

Briefly stated, distance reception is a matter of cleanliness, and frequent inspection of the entire set, including the ground and aerial installation.



Armored Automobile-Circuit Cable That Proved Efficient Aerial, and Diagram of Installation

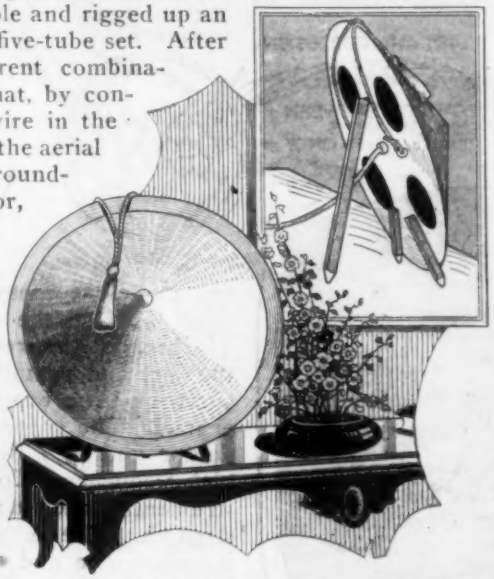
Armored Aerial Minimizes Static

The armored aerial shown in the illustration is easy to install and gives excellent results. As an experiment, I secured a 100-ft. length of single-strand armored automobile-circuit cable and rigged up an aerial with it for my five-tube set. After trying several different combinations, I discovered that, by connecting the copper wire in the center of the cable to the aerial post on the set and grounding the metal armor, much of the usual static disappeared. Distant stations came in with great volume and clarity. In the final hookup, a special lead was taken from the armor to an iron rod driven 5 ft. into the ground, and the regular ground to a water pipe.—G. C. Douglas, Raleigh, North Carolina.

When Radio Set Works Better with the Gridleak Out

If the set works better with the gridleak out, look for trouble in the grid condenser. Often, in a case of this kind, the grid condenser is defective and provides the necessary leakage to make the tube work; poor insulation, not bad enough to make an actual short circuit will cause this condition. If such is the case and a gridleak is placed across the condenser, the resistance is lowered to a point that will produce poor results. A new condenser should be substituted and several values of gridleaks tried until the one is found that will give the best results. Tube sockets made of poor insulating material will often provide a leak for the grid and produce the same results.

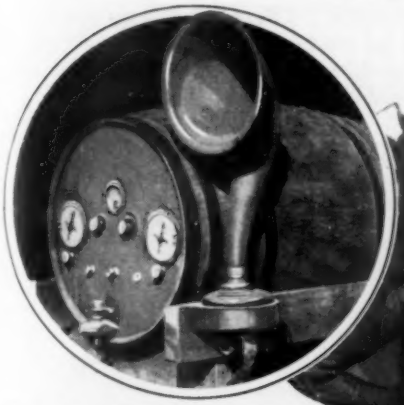
Combination Easel and Wall Speaker



Cone Speaker That Can Be Mounted on Sturdy Easel, Or Suspended from Picture Molding

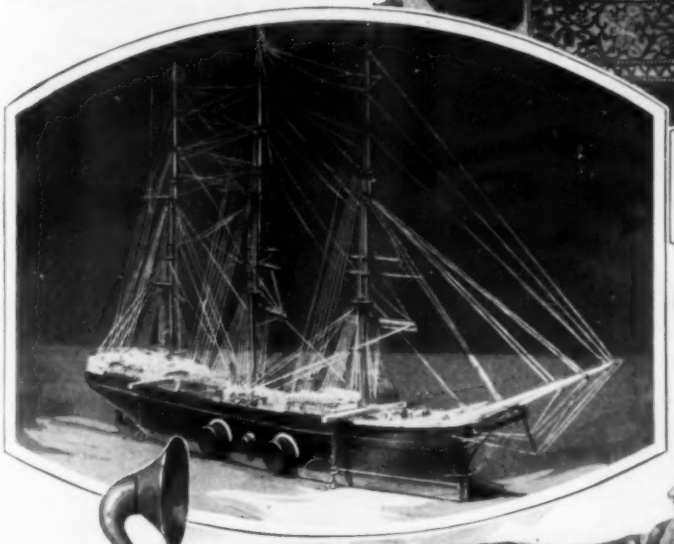
The combination easel and wall speaker shown has lately appeared on the market. The cone is 18 in. in diameter, its edge being heavily embossed, and the diaphragm is of heavy fiber. A steady easel, with rubber-tipped standards, is provided, and a gold cord with tassel is supplied for those who prefer to hang it from the picture molding. It is claimed that the speaker works perfectly in any position it is placed.

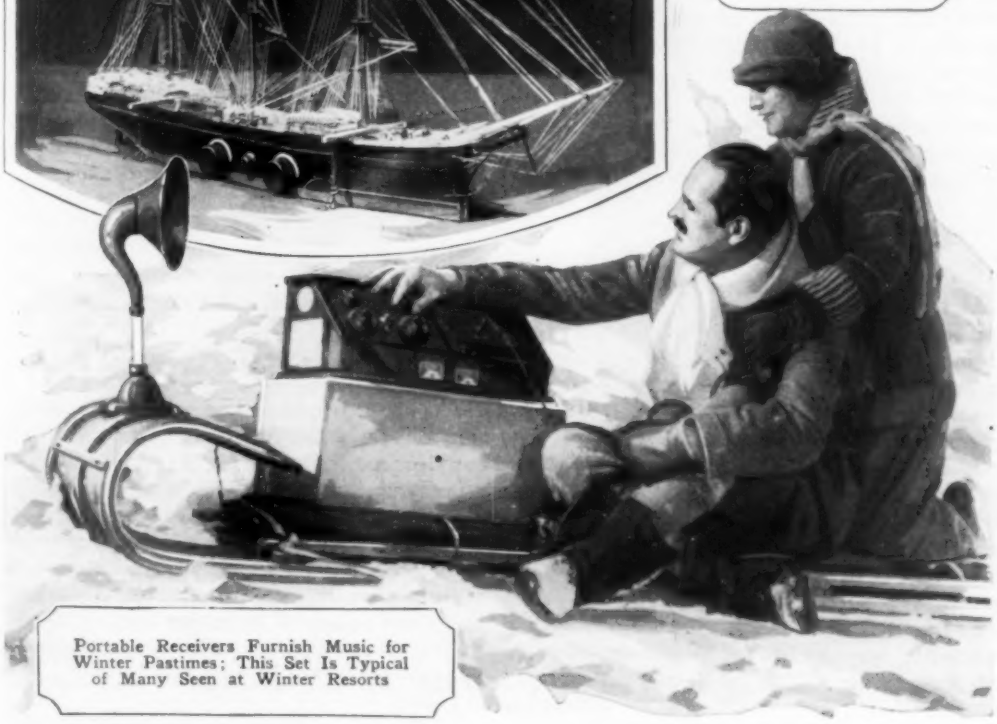
Fads and Novelties of Radio World



One of the Unusual Radio Sets That Attracted a Great Deal of Attention at the Los Angeles Radio Show; the Complete Receiving Set Is Installed in a Keg

Above, Listening to Music Which Is Coming through a Loud Speaker in a Fountain, at the Fair Recently Held in New York City; Left, Set Built in the Hold of a Model Ship, the Copper-Wire Rigging Serving as Aerial

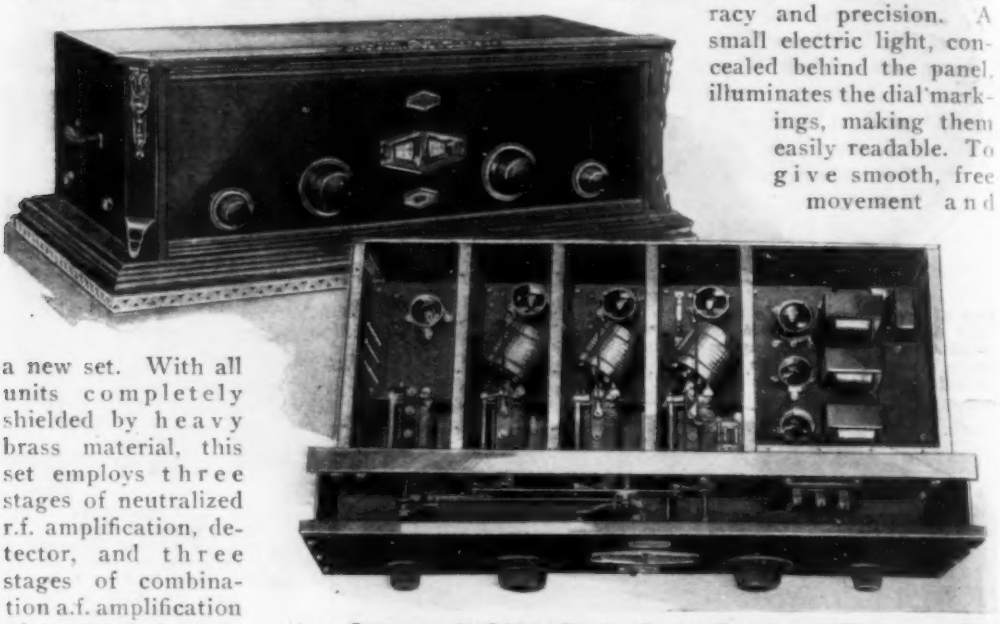




Portable Receivers Furnish Music for Winter Pastimes; This Set Is Typical of Many Seen at Winter Resorts

This Seven-Tube Neutrodyne Operates from a Loop Aerial

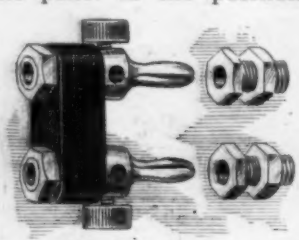
A seven-tube neutrodyne operating on a loop aerial is the outstanding feature of a new set. With all units completely shielded by heavy brass material, this set employs three stages of neutralized r.f. amplification, detector, and three stages of combination a.f. amplification of special design. It is also adapted for use with light-socket power devices, and is simple in design and attractive in appearance. The operating panel is made of aluminum, stained and grained to represent a rich walnut finish. A dual tuning control is used, and the panel is constructed in such a way that the dial markings are visible through a window in its center. These markings are calibrated in wavelengths, each receiver being tested with a specially built wave-registering instrument to insure accuracy and precision. A small electric light, concealed behind the panel, illuminates the dial markings, making them easily readable. To give smooth, free movement and at the same time provide a hairline adjustment, the variable condensers are operated on two link-motion shafts which are controlled by the two tuning knobs. There are no gears to get out of mesh or wear out. The claim is made that the set is extremely efficient on long distance.



Above, Instrument in Cabinet Showing Tuning Controls and Windows for Dial Markings; Below, Interior View with Top Shield Removed

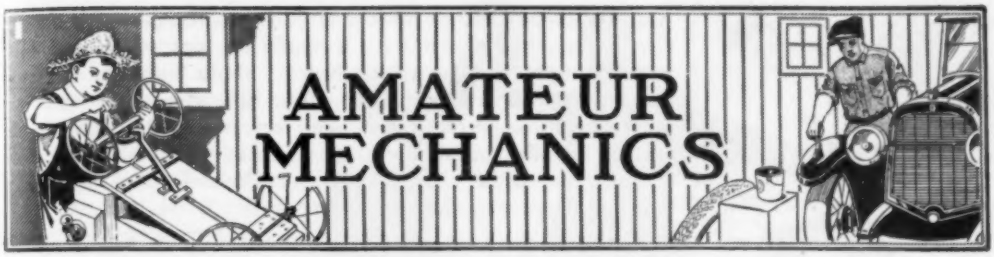
Handy Multi-Connector Plug

A handy multi-connector plug, lately put on the market, has many uses for the radio experimenter. The sockets are mounted on the panel in the position shown and the combination makes an excellent phone or loud-speaker plug. Any number of parallel and series connections may be made by using several of these plugs. The contact points consist of springy prongs which are squeezed together as the plug is inserted, thus making a perfect sliding contact.



Glass Bottles for Low-Loss Coil Forms

Glass bottles, of the type used for pickles and olives, make ideal forms for winding low-loss coils, being highly efficient electrically and non-shrinkable mechanically. The start and end turns of the wire can be held in place with a bit of sealing wax. If desired, the finished coil can be treated with a thin coating of flexible collodion and then removed from the bottle. Coils of this type are very efficient and strong enough for average purposes.



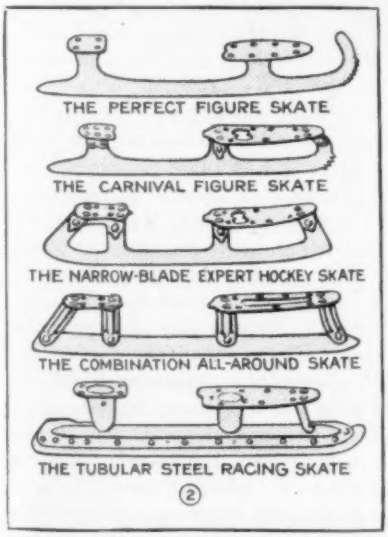
The Art of Fancy Skating

By EARLE W. GAGE

SKATING has the greatest following of all winter pastimes, and is the real "King of Winter Sports." It is an art as well as a sport and gives healthful exercise to all the muscles of the body, bringing them into harmonious development. Every amateur skater dreams of that day when he may be able to accomplish the intricate figures of fancy skating and the fascinating waltz on ice.

First of all, it is important to have a place to skate, and if no natural rink is available near by, it is comparatively easy to construct one. The artificial rink may be anything from a small backyard affair, covering a few square yards, to a large and expensive rink, such as that recently completed at Montreal, at a cost of $1,000,000. Yet there is a real art in making skating rinks, and unless the proper rules are observed, trouble is sure to follow. The lay of the ground should first be considered. The surface should be level, or as nearly so as possible, for the more the ground slopes, the longer it will take to floor every part of the area, making a level rink. Clay land is the best, since it tends to hold the water until it freezes, gravel soil being next best, and sandy soil poorest.

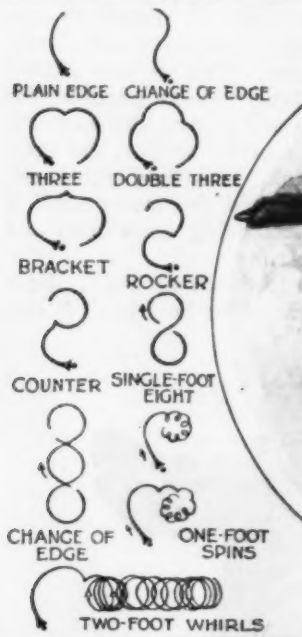
It is necessary to throw up banks about the proposed rink. The best bank is one



Various Forms of Skates, Each Type Being Adapted for a Particular Purpose; the Upper Two Are Popular Forms for Fancy Skating

which has been plowed up and tamped before freezing weather comes. One furrow should be plowed around and the dirt packed down with a spade or tamper to make it solid enough to close all air holes. Or, a board bank may be constructed of 2-in. planks, 10 or 12 ft. long, laid on edge after the loose surface has been scraped to let the plank rest on a solid foundation. The planks should be laid end to end around the rink, 2 by 4-in. stakes, about 36 in. long, being driven into the ground to a depth of 1 ft. at each intersection and nailed to the planks. This serves to prevent the planks from moving under the pressure of the water. The dirt scraped from under them should be tamped around the planks at the bottom. If there is plenty of snow on a level piece of land, it may be possible to scrape off the loose part, forming banks, over which water is sprayed, freezing them solid so as to hold the water poured into the rink. But this takes more time and is less satisfactory than the other method. After these steps have been taken, the rink is ready for freezing. This calls for some time and cannot be hurried. The rink should not be flooded save in extremely cold weather, when an attempt may be made to bring the surface, after it has been properly prepared, up to level. The best way to accomplish this is to use a garden hose without a nozzle, spraying the bank particularly at its base. Do this night after night until there is no possibility of leakage. The surface may be frozen in the same manner, starting the work at the far end and working toward the water supply. Repeat this process until the ice is from 2 to 4 in. thick. Then, when the thermometer falls to from 8° to 10° above zero, connect the hose with a fine rose nozzle, and play the stream up in the air so as to have it come down in the form of a fine mist and freeze on striking the ice surface, which will not allow water to form in pools and cause rough spots. Skating may be started on ice 1 in. thick on the first night after spraying, additional sprinkling giving a smooth surface after the skates

Fig. 3, Middle of Circle, Right Outside Backward; Fig. 5, Start of Right Outside Forward Circle; Center, Various Forms of Fancy Figures



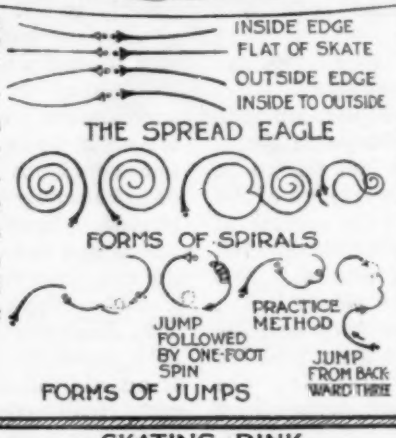
have cut the surface. Continue to spray every night until the ice is 6 in. thick, when you will have a really nice rink.

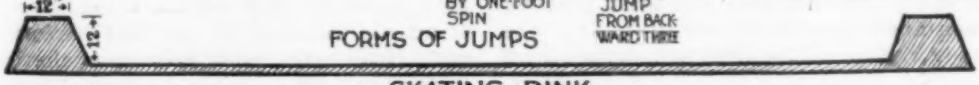
It is possible to build an inexpensive rink on the lawn, if there is a level piece of ground, 20 by 40 ft., by building a clay-loam dike around the border, about 12 in. high by 12 in. wide at the top and with sloping sides. Such a rink will provide ample skating space for a dozen people, and will not injure the grass.

If the rink is constantly used, it is necessary to shave off almost as much ice during the day as was put on the preceding night. This should be done before the rink is used and the process should be repeated several times during the day. The best scraper is made of sheet iron, about 4 ft. long by 3 ft. wide, and is formed like a large dustpan on runners, the edge being about 18 in. high at the back. The runners begin about 6 in. from the front of the scraper and continue along the bottom and up the outside of the back. Two men can push this over the surface of the rink and shave off the surplus ice. It is not necessary to sweep the rink for the water will absorb it. Sprinkling should be done regularly, say, from 6:00 a.m. to noon, and from 6:00 to 10:00 p.m., when the scraping is done, the water sprinkled being left to freeze all night.

A pair of good skates is the next item. There

Diagrams Illustrating the Spread Eagle, Various Forms of Spirals and Methods of Making Jumps; Cross Section of Rink and Dikes; Fig. 7, Position of Skaters for Dancing on the Ice





SKATING RINK

are a score or more styles to select from, each adapted to some particular use, such as general all-around skating, racing, hockey or figure skating. Practically the entire length of the racing skate rests on the ice, while but 4 to 6 in. of the curved hockey skate touches it, and this length is reduced to 1 or 2 in. in the figure skate. Each has a skating surface intended for practical use; the racing skate to secure the greatest speed in a straight course, longer and faster glides being possible with the long blade than with a shorter one. The 15-in. blade is the average for outdoor rinks. The blade is narrow, to assure an easy glide over the ice. The tubular skate, securely screwed to skating shoes, is probably the most popular one now used. This also may be had in several types, from the tubular hockey to the racing skate. It is essential, no matter what type is selected, that only the finest grade steel is used in making the surface. If the maker's name and guarantee are not stamped upon the skates, do not buy them.

There are three distinct styles of skating—English, American and continental. For several years the English style was accepted, but in more recent years the continental has gained in popularity until it is now universal. In this, the body sways with the direction of the stroke, the arms outstretched, indicating the forward movement, and the legs gracefully bent. In the English style such movement is not permitted. The arms are held motionless close to the body, the legs are unbent and there is a great rigidity of the body throughout. The American style is a combination of the two.

The beginner will learn more easily and quickly by having an experienced skater show him the stroke and body movements. A few simple rules should guide these. The toe of the propelling foot has to be turned outward, and the inner edge of the skate must be presented to the surface of the ice. The whole leg should be directed outward from the line of motion. The other foot has simply to be placed in the position for supporting the body and for running forward with the least possible resistance consistent with guiding the body rightly. The arms are swung from side to side, so that they are extended to the right side, while the skater is running on his right foot, and to the left just after the stroke of the right foot is completed. This alternate swinging of the arms comes naturally to the skater in keeping his balance and little attention need be paid to it. Bear these rules in mind when learning to skate: Keep the weight of the body well in front, by leaning slightly forward; allow one foot to complete its stride before the next is begun; turn out the toes, and keep the ankles stiff and firm.

The skater should strive for long and finished strokes, not short, choppy ones. Put all the strength into every stroke, letting it carry you as far as it will. It is by the long, even strokes and the rhythmic swaying of the body that the good skater is distinguished from the beginner. In making a stroke with the left foot, let the body sway slightly to the left, and raise the right foot from the ice.

It is an easy matter to make a turn. When gliding forward with both skates on the ice, the two skates parallel, the slightest effort will incline them to the right or left, and the direction is instantly changed more or less in proportion to the degree of the muscular effort. It is much more difficult to make a stop. The usual method is to let the body lag behind the feet, and then to raise the toes of the skates, allowing their heels to dig into the ice until the friction overcomes the momentum. This requires some skill in balancing, and should not be tried until after the other strokes have been mastered. Another method is to turn abruptly half around and place the sides of both skates exactly at right angles to the line of motion, at the same time leaning over to the side toward which the turn is made.

In fancy or figure skating, very long, sure strokes are essential. Several figures are made while standing on one foot, and one would not be able to travel very far, or to cut many figures, using short, choppy strokes. Special skates are necessary, which are curved, sharp, and pointed at the end, in order to hold when one makes a sudden stop to do some intricate figure. It is absolutely essential that the body be held correctly, and here are the official standards followed by the best performers: Head erect, with eyes upon the ice seldom or never during the free skating,

and, in any case, not more than absolutely necessary; body upright, not bent forward or sidewise from the hips, shoulders thrown back, and chest expanded; arms, whether active or passive, should have free play from the shoulders, elbows slightly bent, hands with the palms downward or inward; skating leg always bent at the knee, to insure a springy rise and dip of the body; free leg poised or swung entirely from the hip, in the socket of which it should be turned outward and backward as much as possible, always separated from the skating leg; knee slightly bent, toe pointing down and out.

The beginner should select a few simple figures and master these before he tries any "tricks." First start on the large figures. There is a mistaken idea that skating these makes the execution of smaller figures more difficult; every professional first started on large figures before he tried small ones. The large figures aid in attaining good form, making the skater more sure, easy and graceful when he comes to the smaller ones.

Fig. 12, Outside Spread Eagle; Fig. 14, Jump from Left Outside Forward Three; Fig. 15, Right Outside Backward Spiral

When walking, progress is made by means of the foot upon the ground, while in skating, all impetus comes from the foot just as it leaves the ground; while walking, we use the ball of the foot to steer and the body follows, and in skating, when the skater desires to turn, the shoulders and hips do the steering and the foot follows. Because skaters have not mastered this simple rule, they find it very difficult to make turns, which are fundamental in fancy skating.

the first thing to learn in figure or fancy skating. This is effected by spread-eagling the feet, and comes with ease to those who are able to get into that posture. For the forward Mohawk, the skater proceeds on a right outside forward curve, and when he is about to effect the change to left outside backward, he thrusts back his left shoulder and brings forward the left leg in front of the right; then, turning the toes out as much as possible, he swings it around and behind the right and places it down on the outside back, and at the moment it touches the ice he takes up the right. The change from a back to a forward edge is made in the same manner, only in this the unused foot is thrown behind the foot on the ice and then swung around the latter and placed in front.

The knack of plain forward and backward strokes and turns may be acquired by the average beginner in a short time. But it is no easy task to become a good figure skater, and it requires long and painstaking practice. Only by tilting the skate is it possible to describe a circle. Only when wearing skates having a curved, sharp, and pointed end, is the skater able to make sudden stops and do figures.

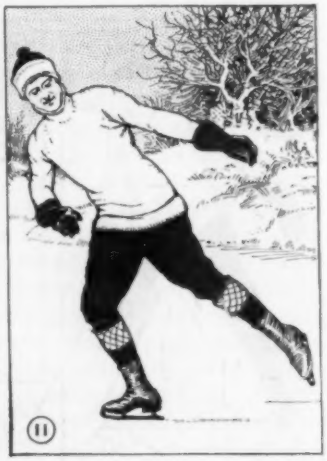


Fig. 8, Approaching Turn, Right Inside Forward Three; Fig. 10, Start of Right Outside Forward Loop; Fig. 11, First Curve, Right Inside Backward Bracket

Irving Brokaw, champion of America, advises that mastery of what is known as the "Mohawk" method of skating from forward to backward, or backward to forward, on an edge of the same character, is the first thing to learn in figure or fancy skating. The outside Mohawks are more difficult than the inside ones, as with the inside

the feet must be turned out far less than with the outside ones. In making the Mohawk, the body is turned in the same way as in doing a "common bracket," also known as a "Mohawk on one foot."

The skater may go from outside forward to outside backward by simply bringing the left shoulder forward instead of backward and rotating the body in the direction of an ordinary three. It is necessary to make a jump, since the toes must be turned in at an extremely sharp angle just as, in the Mohawk, they are turned very much outward.

Three points should be borne in mind: Keep the skating or used knee bent at all times; carry the unused toe down and outward; learn to copy the correct skating positions found in rule books, which give the correct professional positions. The skater should aim to obtain power and control on both feet. Usually one foot is weaker than the other; practice most on the weak foot at the start until it becomes as strong as the other, for no person can be a good fancy or figure skater who is a one-legged skater.

There are two edges to every skate, the inside and outside edge. The inside edge is the one on the inner side of the foot, while the outside edge is that on the outside side of the skate. When the skater is moving on the right foot in a curved direction to the right he is on the outside edge, and when he is moving on the right foot in a curved direction to the left, he is on the inside edge.

"Spins" include artistic skating done on one foot, while "whirls" refer to those done on both feet. To make a spin, the skater starts very slowly, to secure proper balance, and comes up to the flat of the skate, the used knee bent and arm outstretched, looking around in the direction of motion, holding head and shoulders bent slightly forward. Lean a trifle on forward part of skates, balance foot carried rather near the ice; come out of spin easily and without losing balance. If done in the proper manner, ringlet marks appear on the ice. This should be practiced both forward and backward, on right and left foot and all edges. There are several variations in this, as the drawing shows.

The two-foot whirls are made by starting on outside forward of one foot, turning by means of a three to other edge backward; bringing balance foot directly on ice about 18 in. from the other foot; arms outstretched at first and then quickly brought to sides, making the finish by remaining on one foot for several revolutions, while raising the other foot off ice.

The spread eagle makes a very pretty and artistic number. Not every skater can do this at first, although a few lessons will accomplish the art without great difficulty. Perseverance will master it, unless the skater is bowlegged. It gives the easy and graceful bearing which every good skater wishes to acquire, and is of great assistance in executing Mohawks, threes, brackets, rockers, etc. It is essential that the head and body be held erect and the legs straight without being bent at the knee. The spread eagle may be skated either on the inside or outside edge or in a straight line. Both legs must be turned directly outward from the hips, with heel pointing to heel, and muscles brought into play

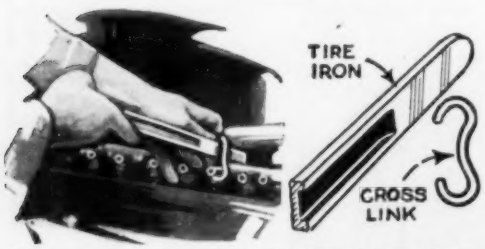
which are not usually employed in skating. Until the muscles have developed, the beginner will have an ache in the calf of the leg. In the outside position the skater leans backward as far as possible, with legs wide apart, and in the inside, he leans forward, keeping whole body erect.

There are various methods of making spirals, and these afford the greatest test of graceful bearing that the skater can hope to attain. Much strength and power is needed to hold a position to the end of the large circle, so the beginner should start on simple spirals and gradually work up to the larger and longer ones as his experience and endurance permit.

Although jumps give the spectator the impression of agile action, spectacular and difficult, they are very hard on the skater, and call for much experience and practice. They may be made from threes, forward and backward, loops, brackets, rockers and counters, and should be practiced with either foot. A jump may be made from one foot to the other or on the same foot. Professionals do such spectacular stunts as jumping over a row of six or eight barrels, or over the backs of skaters, but the amateur will need considerable practice before be will feel safe in trying to span even a small box.

Waltzing on skates is one of the most popular pastimes of the winter, and is a delight both to performers and spectators. This art has little in common with its ballroom cousin, save the position of the partners, their simultaneous rotations, and their moving to the tune of music. The glides are long, in yards instead of inches, with smooth, circling movements. The step is nothing more than an ordinary forward outside edge on one foot, followed by a three-turn to the back inside edge on the same foot, and then a passing, with a gliding step, to the backward outside edge on the other foot.

Lifting Valve-Rocker Arms



Tire Iron and Cross Link Facilitate Lifting Valve-Rocker Arms

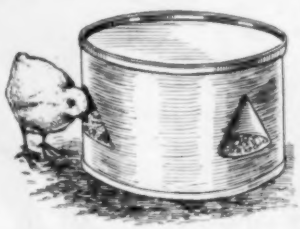
An old truck-chain cross link, with the ends spread apart, may be used with a tire iron to lift valve-rocker arms on overhead-valve motors for the removal of the push rods. It takes little space, may be picked up in any junk yard and serves the purpose very well.—Richard C. Tarr, Gloucester, Mass.

Making Paint Stick to Glass

Most of us know that it is next to impossible to make paint stick to glass permanently. It chips off soon after its application and several coats are worse than one. To make it stick, melt an ounce of clear rosin and, before it has cooled completely, dilute it with enough turpentine to keep it in a liquid state. After mixing the paint to be used, pour it into this solution and there will be no trouble. The work takes only a few moments and the resulting job will be permanent.—L. H. Georger, Buffalo, N. Y.

Automatic Chicken Feeder

A simple and efficient automatic feeder for small chicks may be made as follows: Take an empty tin coffee can, or other suitable can about 6 in. in diameter, and with a pocketknife cut three horizontal slits in the side, about 2½ in. in length, equal distances apart, and about 1 in. from the bottom. Then crush in the can above the slit sufficient to allow the chicks to feed. The sharp edges should be bent over to avoid injury. Altering a large can in the same way will make a good self-feeder for larger chickens.—F. J. Hiscock, Cody, Wyo.



¶When paper sticks to a negative while printing, it can be removed by soaking both in hypo.

Remedy for a Leaky Chimney

In the rooms immediately below the chimney there was occasional evidence of a leak during heavy rains. Repeatedly roof men made repairs which were intended to correct the trouble, but the leak persisted. Finally it was observed that no leak appeared during those months of the year when the heating system was operating, no matter how hard the rain. From this fact it was discovered that a few porous bricks in the chimney right at the roof line were causing all the trouble. The water was working its way into the bricks and completely around the flashing. When the chimney was in use, the heat apparently dried the water out faster than it could soak through the bricks. Painting the bricks at the roof line with a heavy roof paint remedied the trouble.—L. I. Thomas, Oak Park, Ill.

Identification Tags on Umbrellas

Umbrellas are often lost and as they are not usually provided with identification tags, they are not returned to their owners. The tag shown in the drawing has been found handy and it is not in the way. It is attached to the band used to tie up the umbrella. The band is cut out on the inside and a piece of paper covered with clear photographic film is sewed on, as indicated. After the name is printed on it with ink the paper should be waterproofed by soaking it in linseed oil.

Spooks in the Dark

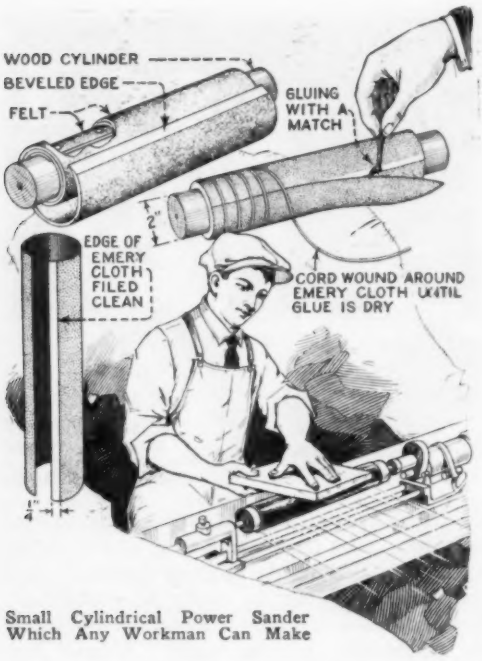
Many spirit mediums use luminous paint in various ways in the production of scenes. Here is one of their tricks, which anyone can duplicate, and it will be the cause of much merriment as a practical joke, especially at Halloween time. The effect is that of a luminous face and hands

Luminous Paint Makes a "Glove Monkey" Appear as a Spook in the Dark

floating through the air and finally disappearing. The hands and face move about naturally, the hands making gestures and the head nodding in reply to questions. Get a "glove monkey," which is made to be operated by one hand. Cover the hands, face and ears with luminous paint, being careful to place black lines between the fingers on the hands. The eyes and mouth are also left black. Expose it to the light five minutes before demonstrating in the dark. It is covered with a black cloth or uncovered to make it disappear or reappear.—Bronaldo Murray, Sturgis, Michigan.

Deflector for Auto Heater

The photo shows a deflector for an auto heater. It is easy to make and costs little. A piece of galvanized iron, 5 by 8 in., is used. It is bent to the shape shown and fastened to the floor under the mat by means of screws and small nails. It keeps the stream of warm air from passing directly to the passenger's face and spreads it over the car.



Small Cylindrical Power Sander Which Any Workman Can Make

Power Sander for Home Workshop

Often it is necessary for the home mechanic to do some sanding in his shop and, if he has a lathe, a cylindrical sander can be made in a few moments. Turn down a roller, about 2 in. in diameter and 10 or 12 in. long. Tack a piece of felt cloth on, as shown in the upper left-hand detail, and bevel the edge of the felt with a wire brush or with a coarse file, so that there will be no ridge when the felt is wrapped around the roller in the direction opposite to that in which the lathe turns. This will prevent the felt from coming loose. A piece of emery cloth is cut out to fit snugly over the roll, allowing ¼ in. for gluing, as shown in the lower left detail, and is filed clean, so that the glue will readily adhere to it. The inner side of the other edge of the emery cloth is stuck over the cleaned portion after the glue is applied, which can be done with a match. To keep the emery cloth on the roller until the glue is dry, wind some heavy cord around it, as shown in the upper right-hand detail. Be sure that the emery cloth overlaps in the same direction as the felt, in order to prevent it from being torn while sanding. The use of sandpaper instead of emery cloth is not advised, as it tears quickly and has to be replaced so often. The felt provides just enough resiliency to protect the emery cloth and make the sanding operation easy.—E. R. Haan, Chicago, Ill.

Paraffin Wax Keeps Paper Clean

I had occasion to make a chessboard recently and, having some heavy white drawing board on hand, I drew the squares and filled them in alternately with black India ink. While making the board, I knew that it would soil easily, but by the time the board was finished I hit upon an idea to prevent the white from showing dirt, or rather a way to prevent dust and dirt from collecting upon it, by rubbing it with paraffin wax. Now, after considerable usage, it is still in fine shape and as white as when I made it. I have found that this is an excellent method of keeping drawings and all sorts of cards clean that have to be handled much.—Edward H. Flaharty, Parco, Wyo.

Novel Use for Drain Tile

The accompanying photo shows a novel use for drain tile. The two pillars on the porch and the pot in the center of the lawn are made of 18-in. glazed tile. The pillars have blocking inside, to help support the weight of the porch roof.—Gordon H. Sears, Holliday, Utah.

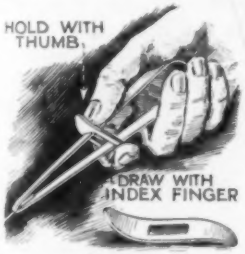
Glazed Drain Tile Can Be Used Successfully as Porch Pillars

New Arrangement for Stamp Album

Collectors of postage stamps are always on the lookout for new methods of arranging their specimens, so that their stamp albums may be made more interesting. Here is a novel scheme which does not require any change in the regular layout. Eliminating the half and one-and-one-half values of the present issue of United States stamps, select good copies of the precanceled kind bearing the post marks of the ten largest American cities. Mount these numerically, each bearing the name of a city according to its rank. Thus the one-cent stamp would stand for New York, the two-cent stamp for Chicago, and so on, until the tenth denomination, representing the tenth city in size. The whole set may be arranged accordingly. Previous issues, or those of foreign countries, may be mounted in the same order, arranging the stamps in the position the cities held at the time that the stamps were current.—Charles E. Forgette, Plattsburg, N. Y.

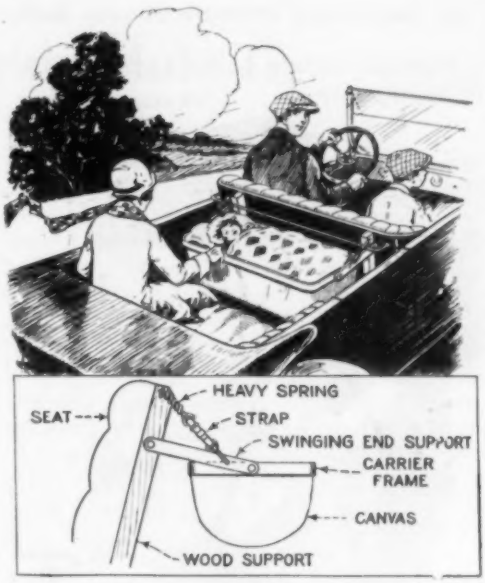
Powerful Tweezers Simply Made

An unusual type of tweezers for light work, which has an extraordinarily firm grip, is shown in the illustration. It will be found especially useful when the pressure must be maintained for a considerable length of time. The tool resembles the conventional type, except that a link is passed over the legs. Holding the upper end of the link with the thumb, and drawing back on the lower end with the index finger, as shown, produces a powerful grip at the points.



Baby Carrier for Small Autos

Most baby carriers for the automobiles are made for larger cars and as I could not buy one that would be suitable in my Chevrolet touring car, I made the one shown in the illustration. A strip of ½-in. strap iron, bent to a rectangular form,

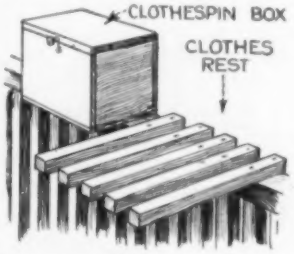


Homemade Baby Carrier Which Fits behind the Front Seat in Any Small Auto

about 14 in. by 2½ ft., makes the frame for the carrier. The overlapping ends are drilled and fastened with screws. A ¼-in. hole is drilled through the center of the ends, so that the frame can be pivoted on two supports, which are also made of strap iron. These supports are arranged so that they will swing a little on a vertical wooden support, and a heavy spring and strap hold them in position. Details of the construction can readily be seen.—Guy E. Clark, Everett, Wash.

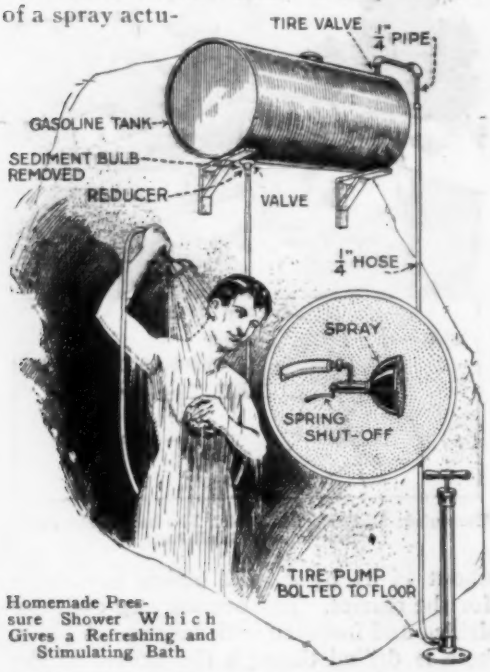
Reducing Labor of Hanging Clothes

When clothes are hung on the line, one's back soon begins to ache from stooping so often to pick up the clothes out of a basket and then to gather up the clothespins. To do away with this trouble, it is a good idea to provide a rack of suitable height for both the clothespin box and the clothes basket on a near-by fence or attached to the clothesline pole.—F. Ellis White, Brockton, Mass.



An Improvised Pressure Shower Bath

Portable shower baths usually consist of a spray actu-



Homemade Pressure Shower Which Gives a Refreshing and Stimulating Bath

ated only by the fall of the water from overhead by gravity. These do not stimulate the skin and circulation like the needle baths, and a shower that will approach the qualities of the latter can be made by the home mechanic at slight expense. Arrange a shelf for a tank near or over the bathtub and low enough so that the tank can be readily filled with water. It is a discarded automobile gas tank of the kind that can be sealed so that it will withstand a few pounds of air pressure. Set the tank on the shelf and clamp it in place securely. Drill a hole in the top near one end and solder in a tire valve. Connect this with two elbows and two short pieces of ¼-in. pipe, so that one piece points down alongside the tank. Then remove the sediment bulb from the outlet underneath and substitute a shut-off valve and nipple, or reducer, as shown. Drill two holes in the foot of a tire pump, screw the latter to the floor beneath the air-valve inlet and connect the two with a ¼-in. rubber hose. Connect a sufficiently long piece of wire-wound pressure hose to the valve under the tank and fit the other end with a spring shut-off valve, such as can be taken from a discarded farm-spray outfit. To the end of this attach a spray head. If possible, choose one of a shape that can be hooked over the upper valve stem when not in use and thus be held out of the way. To use the shower, remove the filler plug and pour in water until the tank is three-fourths full. Replace the plug with a rubber gasket to insure a tight seal. Force in air to several pounds' pressure with the pump. The tire valve acts as a check. When ready for the shower, open the tank valve and press the lever on the spring valve next to the spray head. The water will be forced down with enough pressure to give an exhilarating bath. When through, shut off the tank valve to guard against any leaking from the spray and hang the latter over the valve handle, as suggested.—L. B. Robbins, Harwich, Mass.

Removing Stuck Lead from Tip of Refillable Pencil

When the lead becomes jammed at the end of refillable pencils and cannot be driven out, the only remedy is to drill it out. The main objection to this process is that, in the average household or office, a drill of the proper size is not at hand, and even if the regular twist drill of the proper size is used there is always the risk of enlarging the hole so that afterward the lead will wobble. For an emergency drill, get a large-size needle which will slip freely into the bore. Break off the end about halfway down the eye, as indicated, which will give you a two-pronged drill. The best plan is to hold the needle with a pair of pliers or drive it into the door casing, point first, and, after inserting the eye end in the pencil point, revolve the pencil between the fingers. Clean frequently as the drilling progresses.

¶Commercial film is developed in the same manner as any other film; the resulting negative can be used for contact printing or enlarging, and if the prints are tinted, they make very attractive pictures that are a decided novelty.

Make This Kicking-Mule Toy

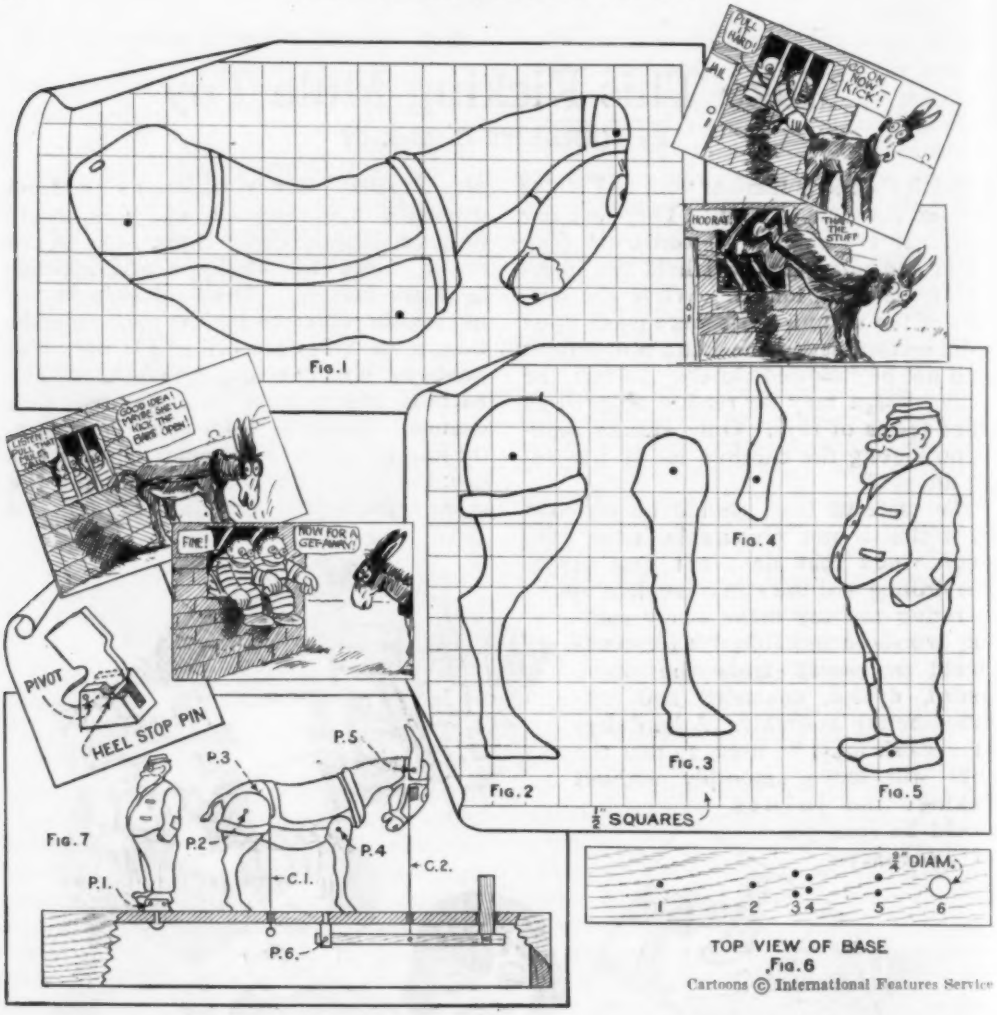
By HERBERT C. McKAY

EVERY child is familiar with Si Perkins and his mule "Maud." There are few toys that are simpler to construct than Maud and none that will hold the interest of the child longer. While the outlines of the various parts were made upon ½-in. section paper, the exact proportions need not be followed closely. In fact, the whole design may be readily adapted to other forms of toys. Only Maud's reputation among the children led to her being adopted.

The material used should be plywood or, if this is not procurable, some soft, tough wood that does not split easily. The drilling and the strain incident upon operating the toy make easily splitting woods unsuitable. The parts should be sawed from the wood, sanded, drilled, enameled and varnished before assembly. A hard-drying varnish must be used, so that the parts will move smoothly without sticking; the joints should be free, yet no excessive play allowed. The wood itself should not exceed ⅜ in. in thickness, and ¼ in. would be even better. Fig. 1 is the body of the mule. Note that all limbs and appendages are lacking. The oval hole in the hip region is pierced for the tail. In addition, three holes are drilled for the pivot joints for hind and forelegs and ears. The harness and features are painted with enamel. The body color is a dun brown, the harness some bright color, such as yellow, the nose pink, the eye white and the other indicated features in black. Fig. 2

Cartoons © International Features Service

"Si" and "Maud," the Well-Known Kicking Mule, Will Keep the Youngsters Amused for Hours at a Time



is the hindleg pattern. Two of these are needed. The color scheme is the same as for the body, although the feet may be painted white, if desired. The fetlocks are painted with short black strokes. A hole is drilled as indicated. An ordinary dressing pin, cut off about ⅜ in. below the head, is driven into the edge of the leg at the point shown. Fig. 3 is the pattern for the forelegs. They are drilled as shown and painted like the hindlegs. The ears, Fig. 4, are drilled and painted in some bright color. This is unnatural, of course, but will please the children.

Si himself is made as shown in Fig. 5. This is the most intricate figure to saw and color, but by following the pattern it will not be difficult. The coloring may be done according to taste, but bright and inharmonious paints give the best effect. The outline about the hat has not been carelessly drawn. If a brim were left on the hat, it would be broken almost immediately. The general appearance of the figure is immaterial as long as it leaves a solid enduring form. In the original, eyes, beard and shirt collar were white, the shirt a light blue, the vest bright red with black polka dots, the trousers dark blue with green and yellow patches, the shoes black and the face a reddish orange. A hole is drilled in one foot, as indicated.

When these parts are completed, the base is made. This is a board, 5 in. wide and 2 ft. long, and is shown in Fig. 6. In this base nine holes are drilled. These holes may be identified by the numbers appearing directly below them. Their ex-

act spacing should be determined by placing the completed and assembled figures upon the base and then marking the base accordingly. No. 1 is for the screw which holds Si's support in place; No. 2 is a 1/16-in. hole through which passes the kicking cord (C1, Fig. 7); No. 3 are for the screws which secure the lever supports; No. 4 for the screws which hold the forelegs in place; No. 5 are two holes for the bridle reins (C2, Fig. 7), and No. 6 is ¾ in. in diameter, in which is placed the stump holding the bucket of oats.

The stump is a roughly round plunger, painted brown and gray, which will just slip easily into the hole provided. The top is shaped to represent a bucket or tub. This rests upon the end of the lever. The entire mechanism, as shown in Fig. 7, consists of two supports between which is pivoted the end of a long lever. These parts need not be made to dimensions, as the principle of action may be easily seen. A cord is fastened to one ear of the mule, below the ear pivot. This cord passes through one of the holes, 5, in the base, around and below the lever, up through the other hole, and finally is fastened to the second ear.

Further, a cord is fastened to the pin in one hindleg and taken through the hole, No. 2, in the base. There, it is passed through an ordinary button, back through the same hole and is fastened to the pin in the other leg. The button should hang about ¼ in. below the base. Next, a semicircular support is cut from the plywood and screwed to the upper part of the base behind the mule. The exact position should be determined by trial. The figure of Si is secured to this support as shown. His feet must be far enough above the base so that he will fall freely without digging his toes into it, and a stop pin provided under the heel, so he will stand upright, as shown in the detail. Small pieces of black paper glued to the bridle reins provide blinders, while several lengths of common cord, passed through the tail opening and tied, make the tail. Supports for the base complete the toy.

When the oat bucket is suddenly pushed, the bridle reins are pulled down, bringing the mule's head down while the ears remain perpendicular. This gives the appearance of the ears being laid back. At the same time, the hindquarters of the body, which is pivoted at P4, will rise, but since the cord C1 prevents the tops of the hindlegs from following, they will turn upon the pivot P2, and the heels will kick out and strike Si. Being pivoted at P1, he falls upon his face.

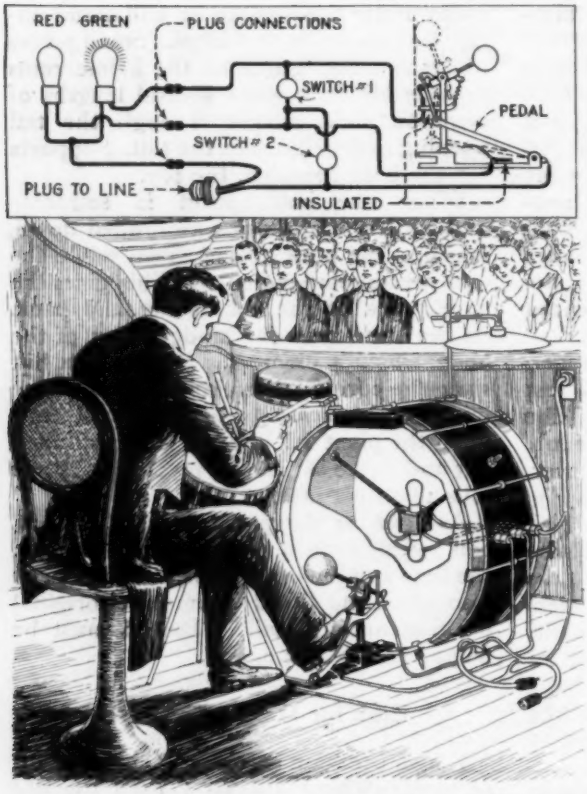
As soon as the pressure is released, a coil spring (not shown), hooked between the base and the lever, pulls the latter back into place, and Maud assumes her original position automatically. But Si must be helped to his feet again.

Kink for Hanging Pictures

I had occasion to hang a number of pictures without aid, so I used the old plumb idea by hanging a string, weighted at the lower end, above the picture by means of a thumbtack. When the string crosses the picture at the center on both sides of the frame, the picture is correctly hung.—H. R. Wallin, Tampico, Mexico.

Using the Plumb Idea to Hang Pictures Straight on the Wall

You can make your own auto polish at a big saving by adding 1 pt. of paraffin oil to 1 gal. of pure turpentine, 3½ oz. of citronella and 1½ oz. of cedar oil already mixed; shake frequently while using the polish and dust the car well before applying. This polish is hard to beat.



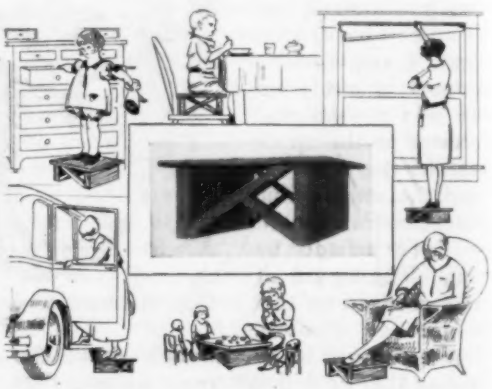
Colored Electric Lights Operated by the Pedal of an Orchestra Bassdrum Increase the Jazzy Effect of the Music

Novel Lighting Effect for Jazz-Orchestra Bassdrum

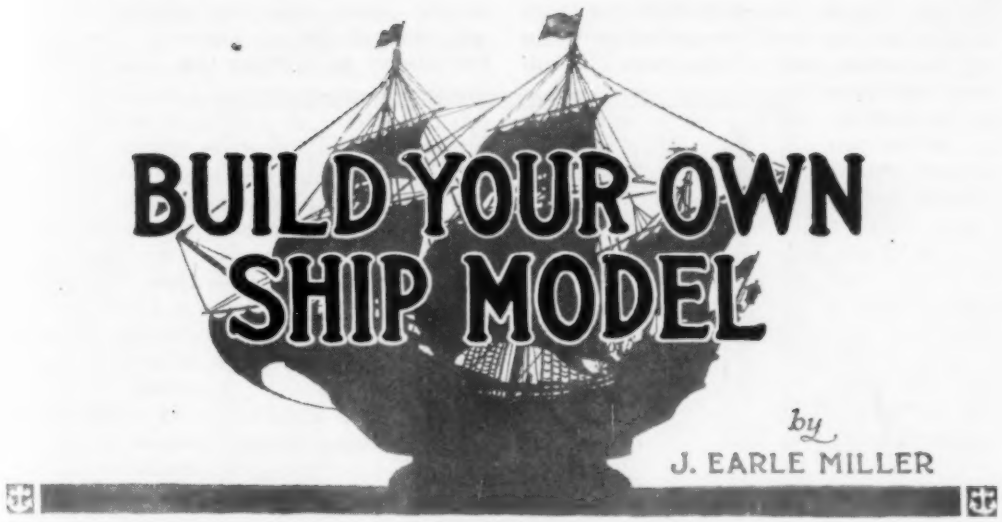
Many bassdrums have colored lights in them which flash on and off by the use of a thermostatic device. This control, however, causes the lights to operate at definite intervals. A variety of colors and unexpected flashes may be obtained by wiring the pedal into the circuit as indicated. When the pedal goes down, a connection is made which causes one color to show, and when it comes up again another connection lights up the second lamp. Various combinations may be produced by putting two switches into the circuit, as shown in the wiring diagram. If switch No. 2 is closed, one light will burn steadily and independently of the pedal. If switch No. 1 is closed, both lights will burn steadily. If both switches are open, the lights will alternate when the pedal is operated. If No. 2 is open and No. 1 closed, both lights operate together when the pedal is pressed and also when it is released. The effect produced is also dependent upon the drummer as he plays the music and can be varied by stopping the pedal before it comes up far enough to make contact. The lamps and sockets are suspended in the middle of the drum as indicated. There must be three electric wires on the inside to make connection with the three on the outside. This is done by the use of radio plugs. As shown in the wiring diagram, the contact springs must be insulated from the pedal.—J. L. Sevedge, Lafayette, Ind.

Handy All-Purpose Stool

For general use about the house, one will find the small stool shown in the photo quite convenient. Some of its uses are shown in the details. When placed on the seat of an ordinary chair, it brings the child up to his plate at the table. It is just right for a footstool and as a step to get at the window shade or the pantry shelf. It comes handy for grandma when she is getting into the car. With a cushion on it, it makes an excellent seat for a child as it takes up only a little space in the car. It makes a fine table for the children's tea party and when placed on a chair it can be used as a typewriter stand. —Leslie H. Phinney, Springfield, Mass.



Small Wooden Stool of General Utility about the House and in the Automobile



by
J. EARLE MILLER

Preceding parts appeared in October, November and December

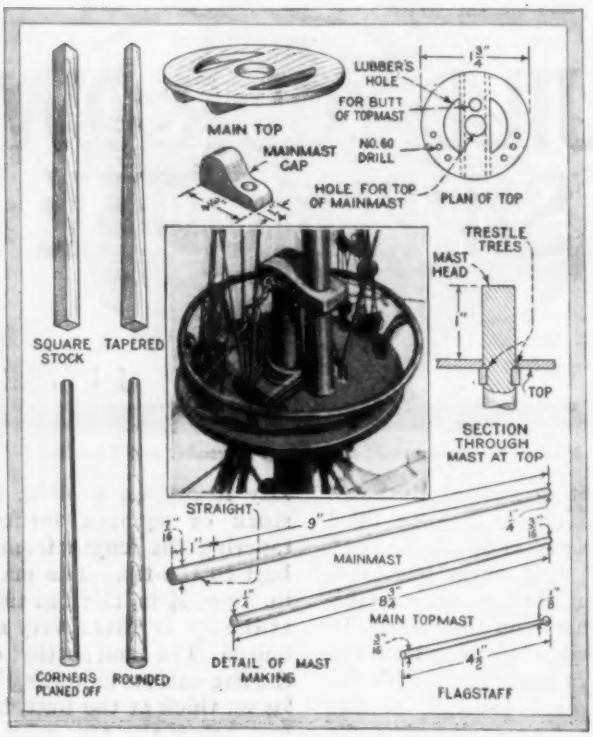
WITH the painting out of the way, the time it is drying can be filled in making the masts and yards of the boat. The "Half Moon" had three masts—a foremast rising from the forecastle, mainmast and a mizzenmast on the poop. In addition, the bowsprit, projecting from the beak, carried a sail in accordance with the custom of the time. Instead of the straight-pole masts of an earlier day, the masts were broken up into lower and topmasts, and the latter were surmounted by smaller poles carrying flags.

Each section of the masts tapers from butt to tip; and the yards taper from the center to the ends. There are several ways of making them, depending upon the tools and equipment available. For the average home-shop conditions, they can either be produced from dowel stock, or from squared spruce. If dowel stock is used, the taper can be put in by shaving the lengths down with a knife or scraper and finishing them smooth and round with various grades of sandpaper. Using spruce, the lengths should be squared to the dimensions of the mast butt or yard center, and the taper then planed on all four sides, after which the corners can be rounded off and smoothed.

The mainmast (lower part) is 9 in. long and 7/16 in. thick at the butt. To this length must be added 1 in. to be let into the hole bored in the deck. The top of the lower section is 1/4 in. in diameter. Lay it out on a 10-in. length of dowel stock or squared spruce, 7/16 in. thick, tapering the length from 1 in. above the butt to the tip. The maintopmast is 8 3/4 in. long, 1/4 in. thick at the butt and 3/16 in. at the tip, so that a very slight taper is required. The final section of the mainmast, the flagstaff surmounting it, is 4 1/2 in. long, 3/16 in. thick at the butt, tapering to 1/8 in. just below the top, with a small ball, or truck, above. If the ball breaks off in cutting, it can be replaced by a bead, but it is more satisfactory to have it an integral part of the mast, since the flag halyard passes through a hole drilled in the ball.

With the three parts completed, the next task is to assemble them. For this purpose, the parts used are trestle trees, tops with their railings, and caps which are set on top of the lower mast and through which the topmast above passes. Details of these parts are shown in the sketches. Starting with the main, or lower, top, cut a disk of 1/8-in. basswood, 1 3/4 in. in diameter, and, through the center, drill a hole large enough to admit the lower masthead for a distance 1 in. below its tip. Slide the top of the mast and mark where its underside comes. Cut two lengths of basswood, 1 3/4 in. long, 3/16 in. wide and 1/8 in. thick, and then cut two small notches in opposite sides of the mast, just below where the top is to rest, making them 3/16 in. wide, so that the trestle trees will rest in them. They should be cut to about half the thick-

ness of the trestle trees, or 1/16 in. deep. Slip the top on the mast, hold the trees in place, and mark on the underside of the top the outer line of the trees. Using these marks as the inner lines, lay out the two semicircular lubbers' holes shown in the drawings. With a small drill, bore a number of holes just inside the lines, and cut out the center with the knife. In the assembly, the lubbers' holes should come on either side of the mast, parallel to the length of the ship. Keeping their position in mind, drill three No. 60 holes in either side of the top, 1/8 in. from the outer rim, approximately 3/16 in. apart, and with the front hole back of a line drawn through the mast hole. These are for the topmast shrouds. Next lay out and drill six other holes, spacing them so the after ones on the sides fall between two shroud holes. These six are for the rail stanchions, and the drill used should be slightly smaller than the diameter of round radio bus wire.



Bend a length of bus wire around the outer edge of the top, so as to form a 1 3/8-in. circle and solder the ends together. This forms the rail. Next cut six pieces of bus wire, 5/8 in. long, and stick them in the six stanchion holes. As the latter are drilled 1/8 in. from the edge of the top, it will be necessary to bend the stanchions outward to meet the rail, which is soldered to them, after which the top and the trestle trees can be glued to the mast.

The cap on the tip of the lower mast comes next. It is cut from 1/4 by 1/4-in. basswood and is 3/4 in. long. A hole is drilled halfway through it, to take the tip of the lower mast, and another all the way through for the topmast. Owing to the danger of splitting the wood in drilling these holes it is best to take a strip of 1/4-in. wood, 1 in. or so wide and several inches long, and drill the holes first, then cut out the cap and shape it. The tip of the lower mast may be reduced in size, so that a smaller hole can be used for it. The upper top is 1/8 in. thick and 3/4 in. in diameter, and is drilled to slide down the top mast 9/16 in. below its tip. There are no lubbers' holes and no rails, but two 1/16-in. holes are drilled, one on either side, through which the shroud lines pass. Owing to the small diameter of the top, no trestle trees are necessary. The maintopmast cap is made in the same way as that on the mainmast, and the flagpole is then glued in place. This completes the building of the mainmast.

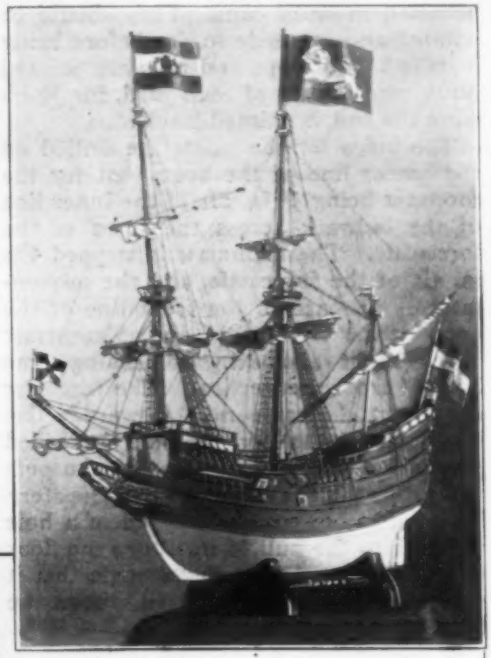
The construction of the foremast is exactly the same. The lower mast is 7 1/4 in. tall, from the deck line, and another inch is added to slip into the hole in the hull. It is 5/16 in. thick at the base and tapers to 1/4 in. at the tip. The foretopmast measures 8 3/8 in., is 3/16 in. thick at the butt and 1/8 in. at the tip. The flag spar topping it is cut from 1/8-in. stock, 3 13/16 in. long, tapering to slightly over 1/16 in. in diameter just below the truck, or ball, which tops it.

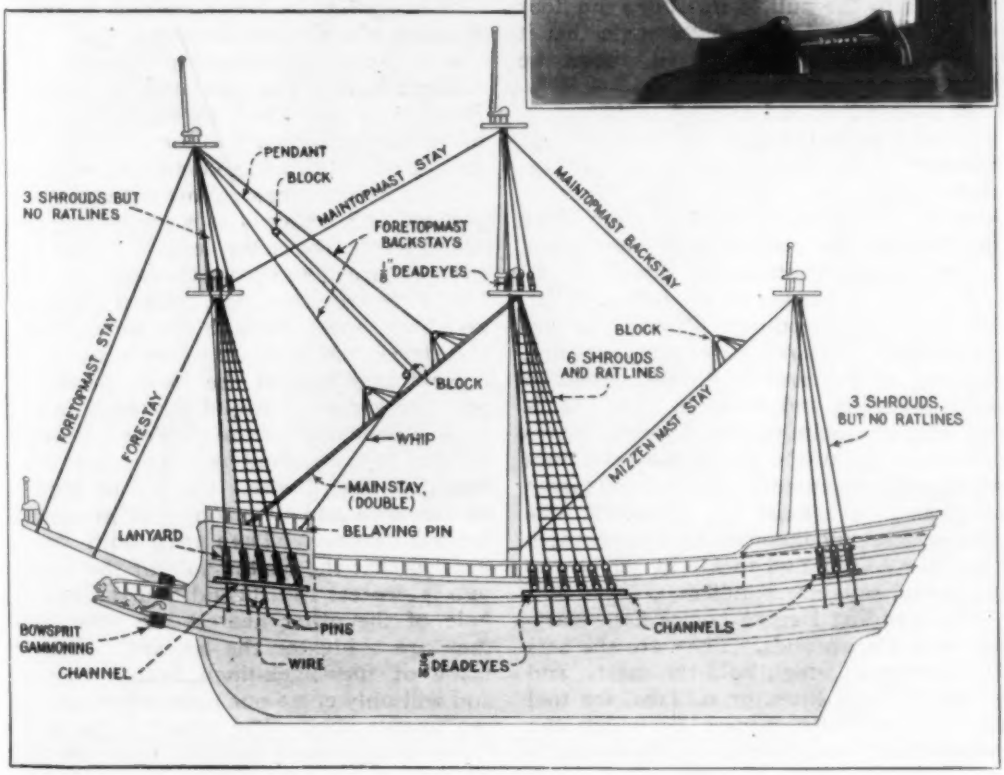
The mizzenmast is a single stick, projecting 7 in. above the deck, 1 in. below it, measuring 1/4 in. through at the butt and 5/32 in. at the tip. It is surmounted by a

¾-in. solid top, with two small holes for the shrouds and by a cap holding a 1⅜-in. flagpole, ⅛ in. thick at the base and 1/16 in. just below the ⅛-in. truck.

The bowsprit is 7 in. long, plus 1 in. buried in the hull. It is 5/16 in. thick at the butt and 5/32 in. at the end, which is surmounted by a small knee, a cap and 2-in. flagpole. The stern flagstaff is 6 in. above the deck, and ½ in. enters the hull. It is reinforced by a second spar, projecting 3½ in. above the deck, the two being tied together by a cap like those on the masts. Both flagstaff and supporting spar are made from ⅛-in. stock, the former ending in the usual truck. A No. 60 hole is drilled through the balls on each flagpole, to take the place of the block through which the flag halyard will run.

The yards come next, lower and topsail yards on the main and foremast, a bowsprit sail yard on the bowsprit, and a lateen yard on the mizzen. As stated before, they taper from the center to the ends and offer no difficulty in making, so only the following dimensions are necessary: The main lower yard is 8 in. long and ¼ in. thick in the center, tapering to slightly less than ⅛ in. at the ends; the main topsail yard is 5 in. long and 3/16 in. thick in the center; foremast lower and topsail spars are, respectively, 6⅞ by ¼ in. in the center and 4⅜ by 3/16 in.; the





spritsail yard is 5½ by 3/16 in., and that on the mizzenmast is a long thin spar, 10½ in. over all and 3/16 in. in diameter at the center.

The dark, yellowish-brown furniture stain, known as golden oak, gives a good color for masts and yards, and can be obtained in small cans. They should be painted and set aside to dry before being installed. The tops and rails are painted black, and the tip of each yard, for ⅜ in. from the end, is painted black also.

The holes for the masts are drilled on the center line of the boat, that for the foremast being 5/8 in. aft of the inner line of the bulwark across the front of the forecastle. The mainmast is stepped 4 3/16 in. aft of the forecastle, and the mizzenmast ½ in. back of the front line of the poop deck. Both main and mizzenmast have a slight rake backward, leaning some 5 or 6° from the vertical. The foremast has about the same rake forward. The two holes for the stern flagpole are drilled just inside the bulwark, so that the pole will project in the same plane as the stern lines. The bowsprit is stepped in a hole drilled into the hull ½ in. above the floor of the beak, and at such an angle that it will pass approximately 1 in. above the head of the lion figurehead.

In assembling and mounting the masts, it should be noted that the topmasts are forward of the lower masts, and the flagstaffs forward of the topmasts. It is not necessary to glue the masts in place, since the shrouds and rigging will brace them, but the bowsprit should be glued.

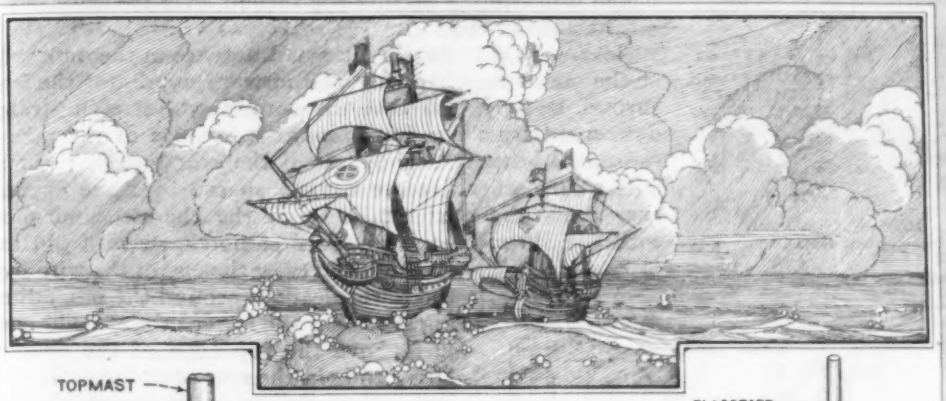
You are now ready to start the rigging, which looks exceedingly difficult, but actually only requires time and patience. Rigging of a vessel is divided into two parts, standing and running. The standing rigging includes the shrouds, stays and backstays of the masts, the fixed lines which are permanently installed and tarred as protection against the weather. The running rigging includes all the movable lines, the blocks and tackle by which the yards and sails are handled.

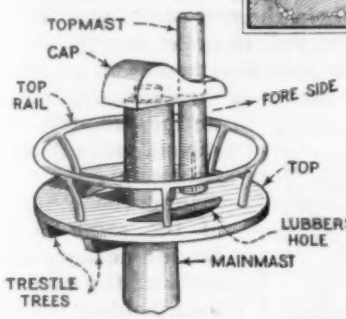
The standing rigging comes first, starting with the shrouds. They are the sets of side braces which hold the masts, and to which cross lines, or ratlines, are tied to form the rope ladders by which the sailors climb to the yards. Each shroud is set up with a pair of deadeyes, circular fasteners, each with three holes, with a lanyard laced back and forth between them, serving to tighten each shroud. The deadeyes for the lower shrouds are 3/16 in. in diameter and those for the upper shrouds ⅛ in. They can be purchased from professional model-makers' supply companies, or made at home. In the latter event, the best material is the black-celluloid knitting needles sold in ten-cent and department stores. If they are used, they should be cut up in lengths of ⅛ in. for the lower deadeyes and 1/16 in. for those on the upper shrouds, and drilled according to the sketch on page 156. A No. 58 drill will do for the larger ones, and a No. 60 for the smaller. It is recommended that deadeyes and blocks be purchased.

The shroud lines should be of strong linen. No. 6 linen fishing line, which can be obtained at a sporting-goods store at about 30 cents for a 25-yd. card, is best for the lower shrouds. The upper shroud lines, and most of the running rigging are made from black-linen button thread. A 100-yd. spool will be enough.

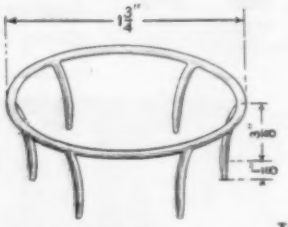
Starting on the lower mainmast, which requires six shrouds on either side, pass the end of the fishline up through one lubber's hole in the lower top, around the mast, and back down through the hole; bring the end down 1 in. or so below the level of the bulwark, and cut off the piece, making two shrouds. Now withdraw the section, and, using it as a guide, cut five more pieces the same length. Pass the ends of three lengths up through the lubbers' hole on either side, around the mast and back down through the hole, giving the six shroud ends on either side.

Next take one of the 3/16-in. deadeyes, pass the end of a shroud around it in the groove provided for the purpose and seize the end to the shroud by wrapping it with fine steel "hair" wire. Cut a 3-in. length of the wire and twist one end around a second deadeye. Then turn both deadeyes so that the center hole of the upper one is nearest the shroud and the center hole of the other nearest the wire, and they are ready for the lanyard. This is made of the black-linen button thread, and will only come out right when put on the proper way. The object is to have three straight and parallel lines on the

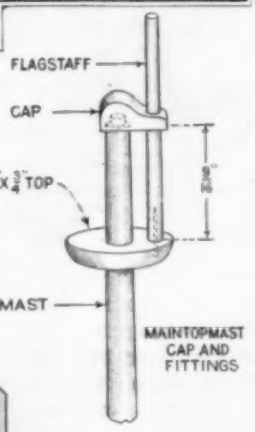




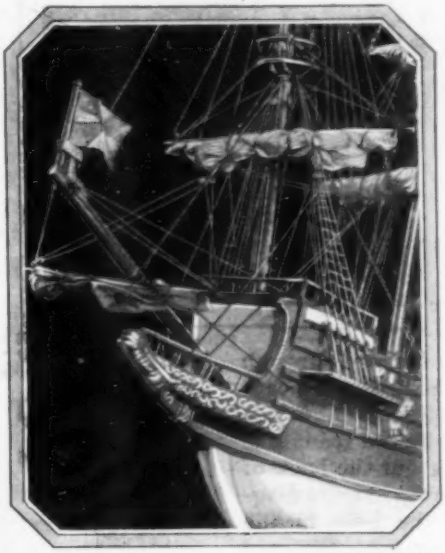
VIEW OF MAINTOP

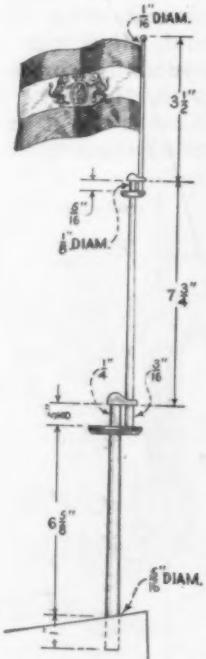


MAINTOP RAIL

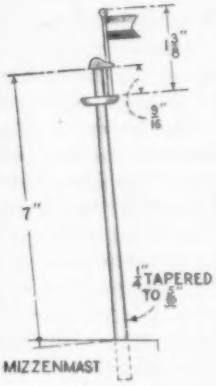


MAINTOPMAST CAP AND FITTINGS

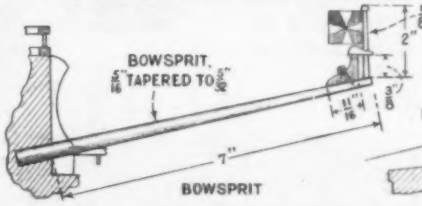




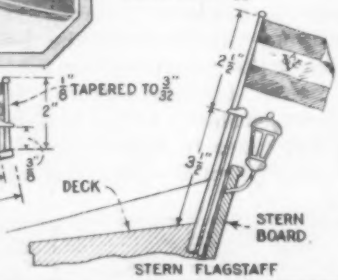
DETAIL OF FOREMAST



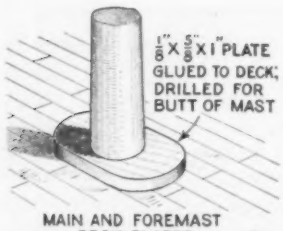
MIZZENMAST

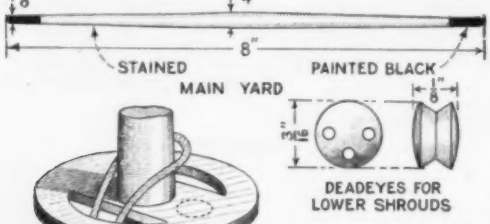


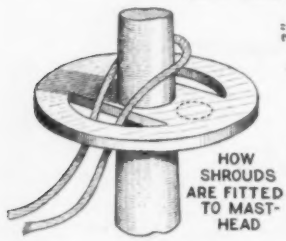
BOWSPRIT



STERN FLAGSTAFF



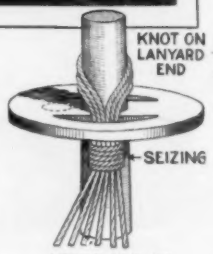


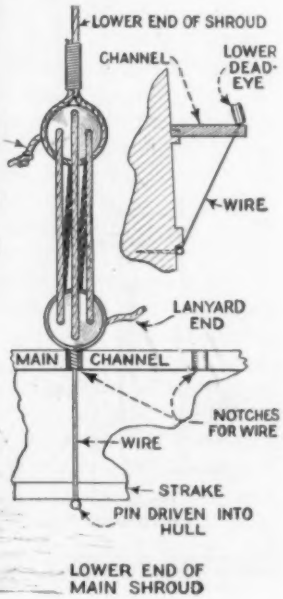


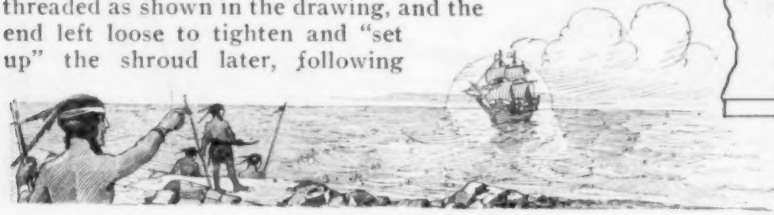
front face of the deadeyes, the center line being the longest. Tie a knot in one end of a 10-in. piece of button thread, making the knot big enough not to slip through the deadeye hole. Then pass the other end through one of the side holes in the deadeye fixed to the shroud. The knot side will then be the back side of that deadeye. Next pass the end of the lanyard through the corresponding side hole of the deadeye on the end of the wire. The side which it enters will then be the front side of that deadeye. Coming out the back of this lower deadeye, the lanyard goes diagonally up the back to the hole in the center of the upper deadeye, entering from the back. Coming out the front, it is threaded as shown in the drawing, and the end left loose to tighten and "set up" the shroud later, following which it is knotted around the shroud, over the wire seizing on the shroud end.

Next, with a knife, cut six small notches in the outer edge of the mainmast channel. The forward notch, for the front shroud, is so placed that the shroud will stretch straight downward from the mast top, and, because of the rake of the mast, bring it slightly aft of the rear line of the mast butt. The other five are equally spaced over the channel. Just above the next strake below the channel, and alined with the shroud, beneath the first notch, drive a pin into the hull, and twist the end of the wire from the lower deadeye around the pin, adjusting it so that the lower deadeye will come just above the top edge of the channel. Drive the pin the rest of the way into the hull. Next pull in or let out the lanyard until the top deadeye comes on a line with about the center of the deck rail, and then tie the end around the shroud and cut off the excess thread.

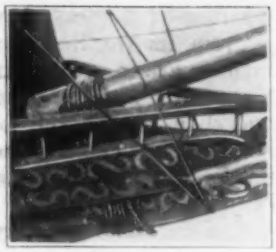
Find the other end of the same shroud, catch a deadeye in the bight of the cord, and then, holding it alongside the completed shroud, draw it taut and adjust the deadeye until it comes even with the first one. Next make it secure, as on the first shroud,



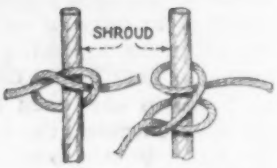


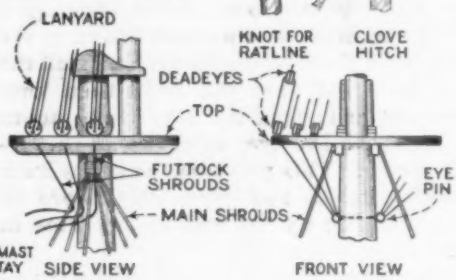


with wire seizing, and then proceed to set up the lower deadeye and lanyard like that already completed. The rest of the shrouds are set up in the same way, taking care to adjust them so that the masts are held upright and in line. The foremast takes five shrouds to the side and the mizzen three. The odd shroud on each is wrapped once around the mast, with an end passed down each side through the holes in the top.

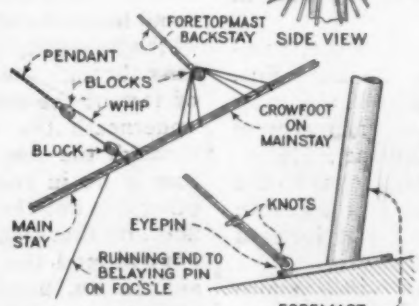


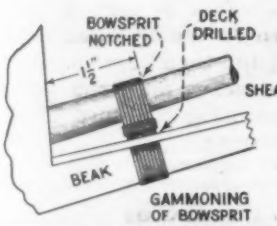
The fore and maintopmasts each take three shrouds on each side, using the ⅛-in. deadeyes. The topmast shrouds are made of the button thread, and the lanyards of a smaller size of black-linen thread, small enough to pass through the deadeye holes. Instead of a wire from the lower deadeye, attach 6-in. lengths of button thread, poke the ends (known as futtock shrouds) down through the shroud holes in the top, pass them through the lower shrouds, and knot them to a wire ring fastened to the lower mast. For this purpose a No. 60 hole is drilled through the mast, an eye bent in a short length of wire, using the nose of a small pair of pliers or a small nail to form it, both ends of the wire passed through the hole, and an eye formed on the opposite side of the mast by placing a nail, or the end of a scriber, between the wires and then twisting the ends together, after which the ends are clipped off close to the eye. The fishline lower shrouds should then be painted black, to represent tar.

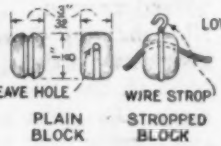


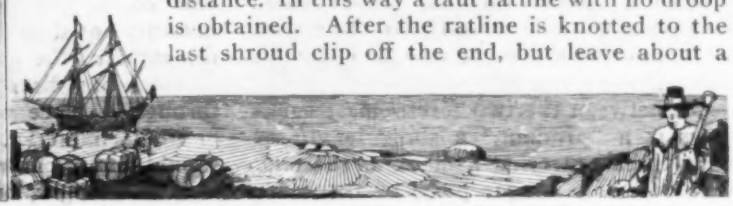


The shrouds on the lower fore and mainmasts require ratlines in order that the sailors may climb to the tops. None are required on the mizzen or topmasts. The ratlines are made of button thread, and are easy to install, though patience is required in tying so many knots. There is some question whether ratlines were attached to all shrouds in Hudson's day, but the more modern practice is to leave them off the forward shroud, or "swifter," and this saves quite a few knots, so that method was followed in this model. Knot one end of a piece of the thread around the second shroud, just above the rail and then, using the simple overhand knot shown (a clove hitch is correct, but is difficult to make so small), tie it to each successive shroud. As the knots are drawn tight, pull the shroud lines close together, and then expand them to their proper distance. In this way a taut ratline with no droop is obtained. After the ratline is knotted to the last shroud clip off the end, but leave about a









quarter of an inch beyond the knot to prevent its working loose. After all the ratlines are in place coat shrouds and ratlines with white shellac, allow it to set, and then clip off the loose ends close to the knots. The shellac fixes the knots firmly and prevents their working loose in the future.

The fore-and-aft stays for the masts come next. Start with the mainstay, which is the heaviest on the model. With the knife, cut a small groove around the mainmast just below the top. Cut a 24-in. piece of the linen fishing line, knot the middle around the mast, and pass the two ends, from opposite sides, through a small eye, made of a pin and driven in the deck ¼ in. back of the foremast. Pull the stay taut and knot the ends, then knot them again around the stay itself, about ⅝ in. above the eye, as shown in the detail sketch. This prevents the knots from working loose, and gives extra cord to enable taking up the stay at any time in the future, if necessary.

The mizzenmast is stayed to the mainmast by another piece of the linen line, one end being knotted around the mast just below the top, and the other around a groove cut in the mainmast, 1¼ in. above the deck. The forestay runs to the bowsprit, being knotted around a groove cut in the latter above and just forward of the head of the lion figurehead.

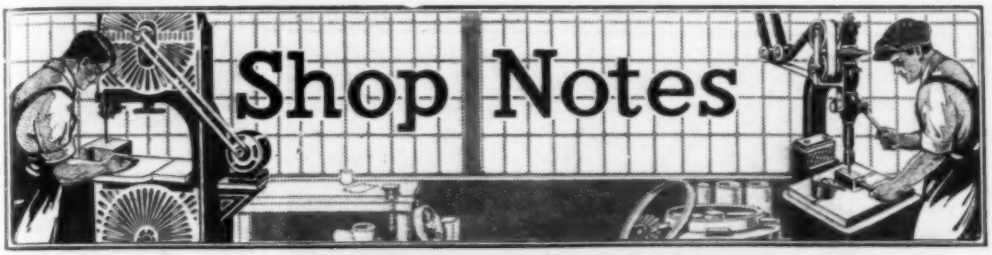
Button thread is used for both the fore and aft stays of the topmasts. The foretopmast is stayed to a wire eye fastened around the knee which supports the flagstaff on the tip of the bowsprit, and the maintopmast stay runs from the top of the maintopmast to the foremast head, being knotted around it just above the lower top, and beneath the cap. The foretopmast backstays, of which there are two, are fastened to the mainstay, the strain being distributed by "crowfeet," made of the light thread used for the upper shroud lanyards. The stay itself is knotted around a block, through which three lengths of the fine thread pass, their ends being knotted along the stay, as shown in the standing-rigging sketch. Running down between the two foretopmast backstays is a "pendant," a short length of light thread carrying a block at the end. One end of a longer piece of the same thread is tied to the mainstay midway between the crowfeet, and the other end passed around the block on the end of the pendant, then through a block seized to the mainstay as shown in the detail, and the running end carried down to a belaying pin on the forecastle pin rail. The blocks are the same as used in setting up the running rigging. The only remaining stay is the maintopmast backstay running from the maintopmast down to the mizzenmast stay, to which it is attached with another crowfoot, as shown in the rigging sketch.

This completes the standing rigging, with the exception of the bowsprit gammoning. Owing to the system of stays, all the strain of all the masts eventually falls on the bowsprit, so extra-strong construction is necessary to carry the burden. Cut eight small notches, as close together as possible, in the top surface of the bowsprit, starting about 1½ in. from the butt. Directly beneath them, either drill eight small holes in the beak floor on either side of the bowsprit, or cut a narrow slot ½ in. long through the flooring. Take a couple of feet of the linen fishline and, starting underneath the beak, push the end up through the slot, over the bowsprit, letting it lie in the first notch; down the other side and through the slot in the beak floor, on that side of the stem. Thence it goes around the stem, up the first side, and so on, until eight lines have been passed around. Draw it as taut as possible, bearing down on the bowsprit until every stay is tight, and then knot the ends beneath the stem, shellac and trim them close, after first painting the cord black to represent the tarring.

(To Be Continued)

How to Bleach Glue

Often it is necessary to have a colorless glue. To obtain this, dissolve the flake glue in water by the heating method and then add one part oxalic acid and one part zinc oxide, the two together making a quantity equal to at least one per cent of the mass of the glue. After every trace of color has disappeared, strain the glue through a piece of doubled cheesecloth or similar material. The whole operation should take no more or less than an hour. —L. H. Georger, Buffalo, N. Y.



All Shop Notes published in 1926, in book form—Fifty Cents—from our Book Department

Making Artificial Ice on the Farm

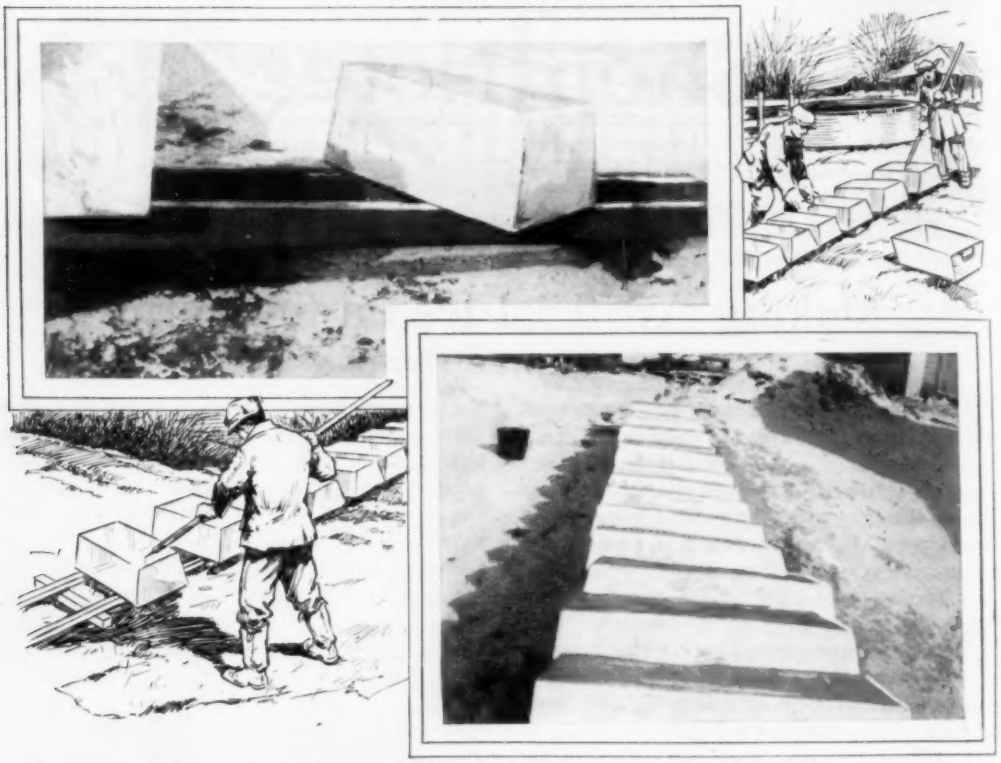
By RALPH W. McPHERSON

THERE are few streams or ponds near the Borreson farm in Saunders County, Nebraska. Then, too, it is just far enough south to prevent reliance on Jack Frost for any great length of time. The ice harvest is always uncertain, and always expensive where a long haul is necessary. Yet the heat of July and August always finds ice in the cave at Borreson's.

Ten or twelve years ago, all the farmers in this neighborhood became excited about making their own ice. All of them tried various means to freeze water from their own wells. For various reasons most of them gave it up in disgust. When the water froze in the containers, they couldn't get it out. Often, in freezing, the containers were broken to pieces. All in all, it was voted a failure.

But it is a real hardship to do without ice in this community, where dairying is

The Ice in the Stock Tank Is Broken Up and Loaded into the Galvanized Containers; Insert, Usually by Noon the Sun Has Loosened the Cakes So the Containers Can Be Lifted Off



Upper Left, the Racks Are High Enough So That the Air Can Circulate Below the Containers; Right, a Line of Cakes on the Way to the Ice Cave

one of the main money makers. Mr. Borreson did without it for two summers. Then he decided that he was somehow going to figure out a way to have ice. He had tried wooden containers before and was convinced they could not be successfully used. In the first place, the water soaked into the fibers and froze so firmly there that it was next to impossible to dislodge the ice. The wood also cracked easily under the pressure of expansion.

To correct these two evils, he set about making metal containers. He used a heavy-gauge, galvanized sheet metal. These he patterned after a cake tin, narrower at the bottom and with flaring sides. Around the top he riveted strap-iron bands, with strong handles at each end that would permit handling with large mittens on.

Experimenting with these containers, he found that the flaring top to a certain extent resisted the pressure exerted by the freezing water, and that the metal of the container was sufficiently elastic to allow for the rest of the strain. The greatest difficulty was that it took the well water too long to freeze. On his next attempt, he cleaned out one of the large stock tanks and filled it with water which he allowed to stand overnight. In the morning there was about two inches of ice on the tank. This he broke up and placed in his containers, filling them with the cold water from the tank. The next morning, his pans contained solid cakes of ice. The broken pieces of ice from the tank had hurried the freezing and at the same time had relieved the pressure so that the containers were not bulged.

Borreson now has eighteen of these pans in use. In freezing weather they are placed on a rack made of two-by-fours which is raised about 1 ft. off the ground. It is but a moment's work each morning to break the ice in the tank and fill the pans. The next morning, the ice cakes are ready, and the pans are slid out into the sunlight and turned bottom up. Ordinarily by noon, the sun's heat has

loosened the ice from the metal and the cakes will drop out into the rack. In this respect, he says, it is important that the containers be filled no farther than within 1 in. of the top, which leaves room enough to jar the cakes loose.

If the weather is too cold to loosen the ice in this way, a couple of kettlefuls of boiling water will turn the trick. Pour the water down the sides and ends first. In the first attempt, the boiling water was poured over the bottom. There was a boom and the bottom of the container burst. The boiling water had caused the formation of steam inside which exerted enormous pressure.

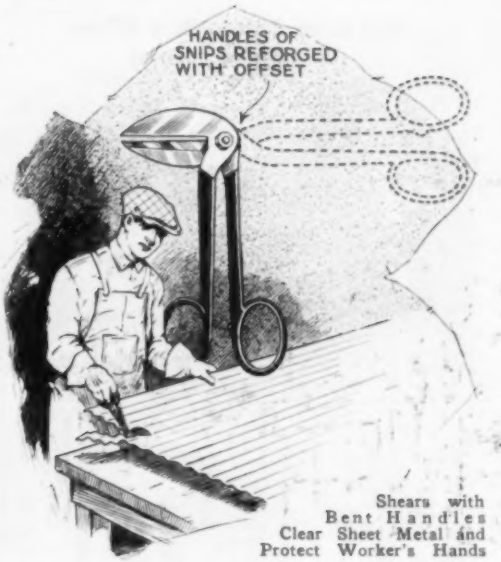
The racks are so arranged that the ice is easily slid right into the ice cave, which is really a cellar dug out beneath the milk house. One man can easily swing the cakes down the chute and into position. They are stored with top and bottom up alternately, so that the flares will fit snugly together, and packed in sawdust.

Water is piped to the house and milk-house. These pipes run through the ice cave, which means ice-cold water all summer long. For the household, there need be no hesitation in using the ice direct, for it is as pure as the water in the well.

"Oh, yes, there's work to it!" Mr. Borreson said. "If there had been a pond or river within reasonable distance, I never would have stayed at it until I made it work. But now the womenfolks wouldn't let me go back to the old way of putting up ice if I could. It's wonderful for them to have that absolutely clean ice whenever they want it. And really I don't notice the work much. It is just an added chore—a few minutes each day while the ice weather is on."

When to Clean Flues

All coal-sooted flues contain sulphur and this causes iron to rust rapidly in the presence of moisture. It is advisable to clean the flues as soon as possible, especially where some of the connections are iron. As soon as the fire is allowed to go out, one should do the work and not leave it until ready to start again, as the soot cakes and is much more difficult to clean out the longer it remains.—Geo. G. McVicker, North Bend, Nebr.



Altered Snips Cut Heavy Sheet Iron Easily

Shears, reforged to the shape shown, far from being awkward, as might at first glance be suspected, have been found better, more rapid and less troublesome in use than the straight type for cutting heavy sheet metal. To make these shears, an ordinary pair is taken apart and the handles are reforged, or bent, just behind the joint as indicated. These shears are especially desirable in cutting across corrugated metal. The worker's hands are protected and the job can be done more rapidly.—G. A. Luers, Washington, D. C.

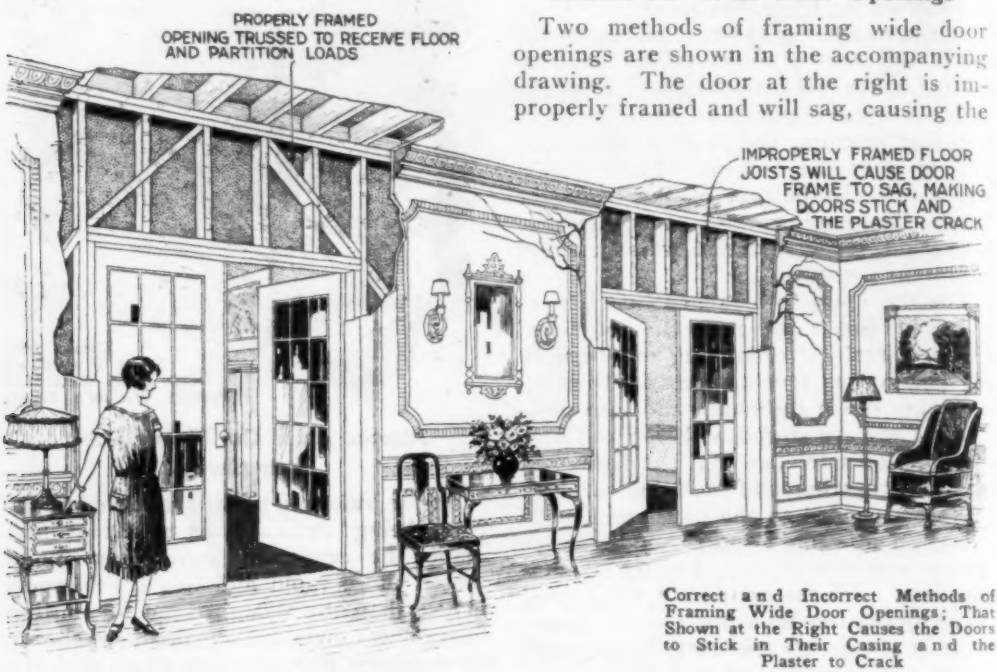
Holster for Service-Station Attendant

With the tool holster shown in the photo the auto-service station attendant is always ready for small jobs as his tools are at hand. The holster contains a pair of pliers, a screwdriver, valve cores and two tire gauges. Besides saving steps for himself, the worker pleases the customers by quick service.—Carlton Groat, The Dalles, Oreg.

Red Lead Better than White for Priming Wood

For the last 20 years or more the customary practice, and the usual advice to all painters, is to use white lead and oil as a priming coat on wood for screens and doors, and other outside fittings. Red lead and raw linseed oil, properly mixed and applied, and allowed to dry well, will produce a better film, which is extremely hard and more elastic than any other material. The reason red lead is found better than white, is that it is highly oxidized and its density very great, so that it works in with the oil and makes a better filler and pore sealer.

It is particularly good for use on sappy and pitchy hardwoods, such as yellow pine, cypress, spruce and all green stock. It prevents resinous matter from seeping through the paint. Most other primers will allow wood to change in dimensions, and this alternate shrinking and swelling is very hard on any paint, but when red lead is used as a base the wood is waterproof and so its moisture does not change. On many finishes where varnishing has to be done, red lead will help preserve the finish. Porch floors will be benefited greatly by being primed with red lead before the finish coats are applied. —L. H. Georger, Buffalo, N. Y.



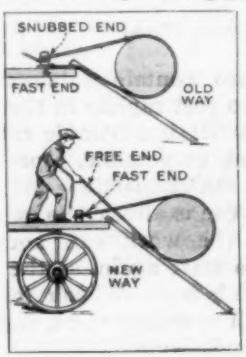
Correct and Incorrect Methods of Framing Wide Door Openings; That Shown at the Right Causes the Doors to Stick in Their Casing and the Plaster to Crack

Frames for Wide Door Openings

Two methods of framing wide door openings are shown in the accompanying drawing. The door at the right is improperly framed and will sag, causing the doors to stick in the casing and the plaster to crack. On the left, the door frame is correctly braced to prevent these troubles, the diagonal braces taking the floor and partition loads and distributing them evenly to the studding.

Improved Snubbing for Unloading Tanks

The usual method of unloading a large tank from a truck is to roll it down on skids, a rope being passed around the circumference and the free end snubbed as shown at the top of the illustration. A better method is to fasten the upper end of the rope, using the free lower end without a snubbing post as shown below. The advantages of this method are apparent; in



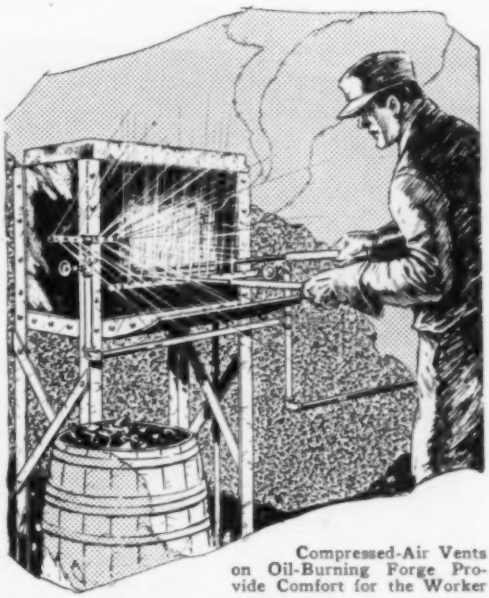
the first case, the rope travels with the tank, the necessary braking friction being obtained by a few turns about the snubbing post, while in the second, these sharp bends are eliminated, as the tank must slide on the rope as a brake drum does in its brake band, furnishing its own friction and lessening the wear on the rope.—E. M. Love, Alhambra, Calif.

Assembly of New-Type Ford Transmission Bands

Transmission bands with a detachable ear can be more readily assembled with some kind of tool which will pull and guide the bands around the transmission drums. Such a tool can be made as shown in the drawing. A piece of steel phonograph spring, about 3 ft. long, was annealed, drilled and slotted at one end with a file, so that it could be attached to the projecting studs on the band. One end was bent back and riveted. The opposite end was fitted with a file handle, which was done by sawing the handle lengthwise and riveting the spring to it. In use, the threading tool is inserted from the left side of the transmission, is pushed around the drum, and the transmission band is hooked into the elongated slots and pulled

Handy Tool Made from Spring Steel Is Helpful in Inserting Transmission Bands

down through the transmission. The tool should be made so that the natural curve of the spring will conform to the drum.



Compressed-Air Vents on Oil-Burning Forge Provide Comfort for the Worker

Protection for the Rivet Heater

Heating rivets in an oil-burning forge is a hot job, but, with the compressed-air attachment shown in the drawing, the discomfort is lessened considerably by an upward blast of cool air that deflects the heat of the furnace from the worker. Pipes, below and on the side of the forge, are perforated with a number of small holes, through which the air is forced out in the directions indicated. As a further protection, two sections of hose are slipped over the handles of the tongs.

Applying Acid to Solder Jobs

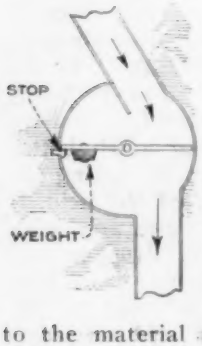
While working on a large job of soldering on galvanized iron, with muriatic acid as a flux, trouble was experienced with the brushes used in applying the acid. The employment of a medicine dropper overcame most of the difficulty. It did not spread the acid so much as the brush does, but applied it to the edges and inside of the joints, making much better and neater work possible. By taking advantage of the bubbling of the acid, it could be spread over a large area with ease when desired. The dropper was found to be easier to use and more economical, as it was not affected by the acid and there was less acid wasted.—Reuben Jensen, Silverton, Oreg.

Sheet-Metal Workers' Trestle Has Side Extensions to Hold the Work Conveniently

Trestle for Sheet-Metal Work

The trestle shown in the drawing is somewhat similar to the form ordinarily seen in metal-working shops, but its use is quite different. The extensions on the sides adapt it to holding work of various shapes. It is made slightly higher, the crosspieces are placed two-thirds the height and the long side sections are nailed on in the positions indicated. It is evident that this trestle has considerable advantage over the flat-top bench.

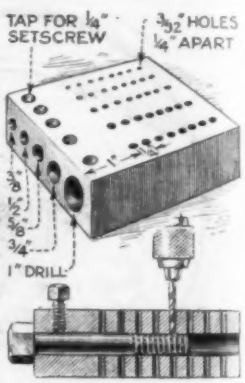
Furnace Feed for Combustible Waste



A semi-automatic feed for the burning of fine combustible waste like sawdust, which will prevent a constant, excessive stream of cold air from entering the firebox, can be made as indicated in the illustration, the details being varied according to the material and rate of flow. The waste accumulates on one side of the damper until the balance is upset, when it automatically dumps down the pipe onto the fuel bed. It is advisable to locate this device a few feet above the automatic stokers if such are used. One side of the damper should be weighted to make it slightly heavier than the other; then, with stops set in the side of the pipe, it will come back into its horizontal position after dumping and close the pipe until another load has accumulated.—Chas. F. Goldthwait, Waterbury, Conn.

Cotter-Pin Drill Jig

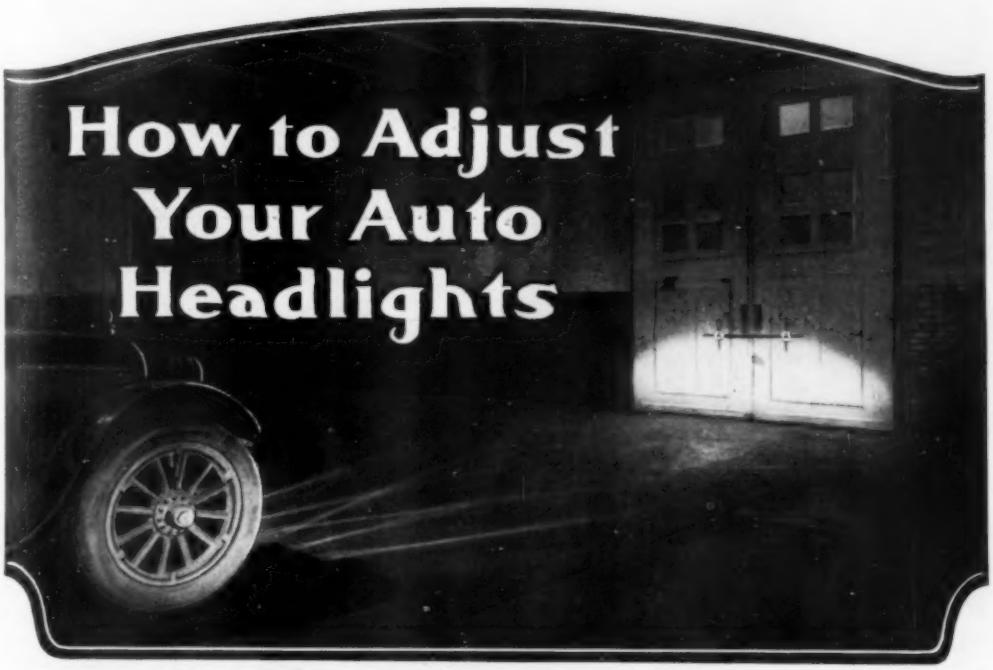
To drill a hole in the bolt for cotter pins without a guide is unsatisfactory. One of the simplest methods of drilling for cotter pins is to use the jig shown in the drawing. It consists of a cast-iron or steel block, with ⅜, ½, ⅝, ¾ and 1-in. holes drilled in the end. At right angles to each hole, and near the edge, holes are drilled and tapped for a ¼-in. setscrew. At spaces starting 1 in. from the edge of the block, ⅛-in. holes are drilled in line through the holes larger than the ½-in. size, while 3/32-in. holes are drilled through the smaller holes in the same way. The drill-guide holes are drilled at ¼-in. intervals. In use, put the bolt in the cotter hole, measure until the correct drill hole is found and then proceed to drill the bolt through the hole.



Razor Edge on Planes

To put a razorlike edge on planes, chisels, etc., grind them on a carborundum wheel in the regular way, and, instead of finishing on a whetstone, do it on a cloth buffing wheel using a little tripoli or putz pomade. A plane iron sharpened in this way will cut hair.

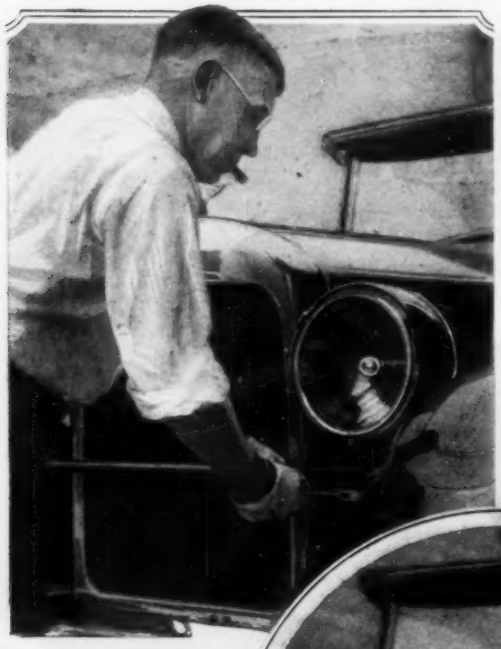
How to Adjust Your Auto Headlights



AS the result of a study conducted by the bureau of standards, during the course of which 400 cars of 58 different makes, employing 47 varieties of lighting devices, were tested, it is stated that 75 per cent of the headlights on automobiles are improperly focused, or aimed, and would throw a dangerous, or at least a very troublesome glare in the face of approaching drivers. Anyone who drives much at night will know that this statement is not exaggerated in the least.

There is no excuse for this condition. The adjustment of auto headlights, while not a job to be done carelessly, is really a very simple one, and one that any driver who takes pride in having everything about his car in first-class condition should learn to do. Even if the driver cares very little whether the other fellow is bothered by his headlights or not, properly adjusted lights will save a lot of trouble on his own account, since he will not continually be called upon to dim his lights during the course of a long night drive, but can go through with the bright lights on, with

Adjusting the Lamps Sidewise So as to Center the Spots on the Marks Made on the Wall



Top, **Loosening the Lamp Adjustment**; Center, Aiming Lamp; Below, Measuring Height of Lamp Center

the assurance that they will trouble no one.

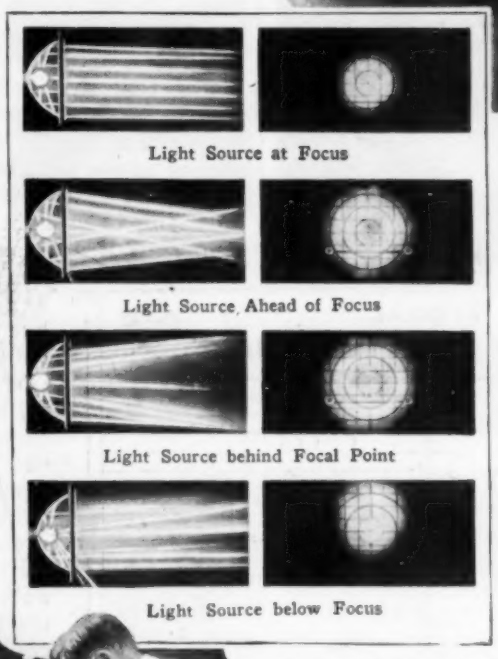
The first thing to do is to put the headlamps in the best possible condition. Take off the lenses and clean them with a stiff brush and hot soapy water. Dirty lenses will absorb a lot of light that would be more usefully employed lighting the road. Be sure the lens is thoroughly dry before replacing it. Next examine the reflector; if it is dirty or tarnished, it should be carefully polished. Use only clean cotton or chamois, with a polisher composed only of powdered lampblack and alcohol. Never, under any circumstances, use a gritty polish for the reflectors, or you will ruin them. Their silvered surfaces should never be touched with the fingers, since these are "salty" and will leave tarnish marks that are practically impossible to remove. Next replace blackened bulbs, and see that these do not wobble in the sockets; if they do, pinching the socket slightly with a pair of pliers will correct the fault.

To focus the headlamps, select a spot where the car may be placed on a level surface, 25 ft. away from a vertical wall or the garage door. Measure the height of the center of the left headlamp and make a mark on the wall, exactly opposite this lamp, at the same height. An ordinary stick will do for taking the measurement, if a rule is not at hand. Do the same with the right headlight. The marks should be in the form of crosses, the horizontal bar of the cross representing the height of the headlamp center, and the distance between the vertical bars the center-to-center distance of the headlamps. Another way to make the marks is given in the heading illustration, where the height of the headlamp centers is shown by a long horizontal line on the garage door, with cross marks to represent the distance between the centers of the lamps.

If the car can be fully loaded while the test is being made, this is all the marking

required, but, as this is seldom practicable, it is necessary to make allowance for the loading of the car, which causes the beam to be tipped up. If the wheelbase of your car is from 100 to 110 in., and it is a touring car, make a horizontal mark on the wall 8 in. below the one already there, and continue the vertical lines until they cross the lower line. If the car is of the same wheelbase but is a sedan, the second line should be 7 in. below the first; if a coupe, 6 in., and so on, according to the table shown on page 169.

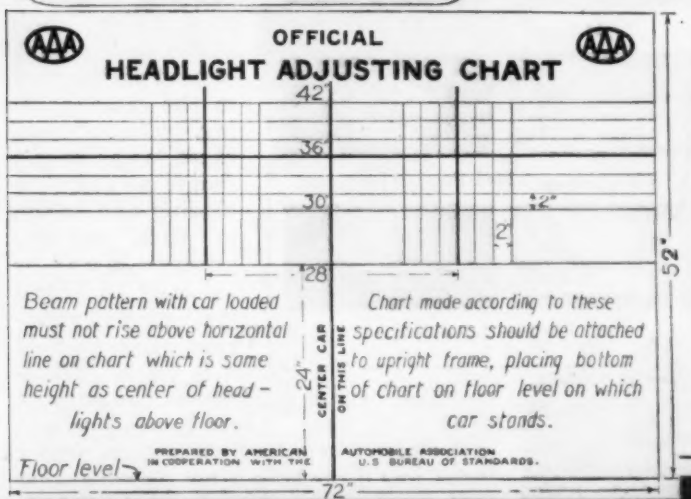
Now cover up the right headlamp, switch on the bright lights and focus the left headlamp until the most concentrated spot of light you can get appears on the wall. The upper illustration in the center of this page shows the kind of spot that should be aimed at. Some lamps have a simple ratchet back of the reflector and the bulb is focused by moving the socket back or forward, one notch at a time, until the best spot on the wall is obtained. Others have a screw in the back of the lamp housing that may be turned with a screwdriver to advance or withdraw the bulb. Still others have a knob instead of the screw in the lamp housing, while some cheap lamps have a simple setscrew binding the socket in place, and the setscrew must be loosened to adjust the bulb and tightened again to hold it in place. Whatever the form of adjustment, the purpose of all is the same. There is only one spot in the lamp where the bulb is at the proper focus, and if the bulb is not placed at that spot, much of the efficiency of the light is lost. Tests have shown that a variation of even 1/16 in. in the position of the bulb means a loss of 68 per cent of the candlepower available; so it pays to have the lamps focused properly. When the left lamp has been focused, treat the right one in the same manner, covering up the left one while doing so. All this is done with the lenses removed.



Top, Marking Center Height on Wall; Left, Correct and Incorrect Focusing; Bottom, Marking Center-to-Center Distance

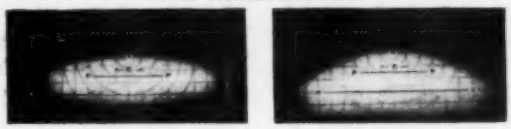
Now replace the lenses, taking care to have the part marked "top" in its proper position. Lenses are usually marked so that the word "top," molded in the lens, reads correctly when viewed from the front of the car. Next, center the pattern produced by the beam from the lamps on their corresponding marks on the wall or door. This is effected by means of the adjustment usually incorporated in the lamp bracket or at the base of the lamp. When the beam patterns have been centered sidewise, tilt the beam downward until the top edge of the pattern just falls on the lower of the two horizontal lines on the wall—the one that was marked to allow for the loading of the car. Ford cars, previous to 1926, have no adjustment to permit the tilting or sidewise movement of the lamp, so the bracket itself must be bent to accomplish this. The heading illustration shows approximately what the beam pattern should be when properly adjusted, and you will notice that the top edge of the beams just strikes the horizontal line. There is only one line showing here, because the car was artificially loaded while the lamps were being adjusted.

Since it is not possible to make lamp bulbs that are perfectly uniform, and since, as stated previously, a variation of even as little as 1/16 in. may lower the efficiency of the light 68 per cent, it follows that every time a new bulb is inserted in the lamp, the light should be focused again. It is not usually necessary to reaim the headlights when a new bulb is inserted, but it would do no harm to check the aiming, since, if the new bulb filament is below the focus, it will have the effect of tilting the beam upward slightly. The pictures on page 167 show a perfectly focused lamp and the spot it produces; a lamp in which the bulb is ahead of focus; one in which the bulb is behind the focus, usually seen imme-


OFFICIAL
HEADLIGHT ADJUSTING CHART
42'
36'
30'
2"
2'
28"
52"
24"
CENTER CAR ON THIS LINE
Beam pattern with car loaded must not rise above horizontal line on chart which is same height as center of head-lights above floor.
Chart made according to these specifications should be attached to upright frame, placing bottom of chart on floor level on which car stands.
Floor level
PREPARED BY AMERICAN AUTOMOBILE ASSOCIATION IN COOPERATION WITH THE U.S BUREAU OF STANDARDS.
72"

Above, Cleaning Reflector; Center, Official Focusing Chart; Below, Properly Aimed Beam Does Not Rise above Horizontal

Rays through Lens with Vertical Flutes, and Right, with Horizontal Prism



Top, Left, Renewing Gasket; Right, Adjusting Lens; Bottom, Two Patterns Produced by Lenses

diately by the presence of a black spot in the center of the area of light on the wall, and one where the bulb filament or light source is below the point of focus. On this page is shown how the lenses affect the beam coming from the lamp. The lens on the left has vertical flutes in the glass and the pattern produced is shown below. In the lamp at the right the beam is bent by means of a horizontal prism, and the pattern shown below is a more desirable one than the one at the left, because the rays from different sections of the lamp are spread. On page 170 two other beam patterns are shown. Both of these are from lamps properly adjusted, the difference in the patterns being due to the different types of lenses employed.

This is all there is to adjusting the headlamps, and it is a small job after all, when the added comfort in driving is considered together with the efficiency of the driving lights.

There are a few more points in the care of headlamps that might be mentioned. When replacing the rims at any time, see that the drain hole is at the bottom, and that the wicking around the edge of the rim, which keeps the casing tight against moisture, is in good condition. A little grease placed around the inside of the rim will make it easier to remove it the next time, and help to prevent rust at this vulnerable spot. When replacing two-filament bulbs having a bright and dim filament, either the bulbs or the plug connectors may be placed wrong side up. Check this by seeing that the lower 21-cp. filament burns when the switch is turned to "bright."

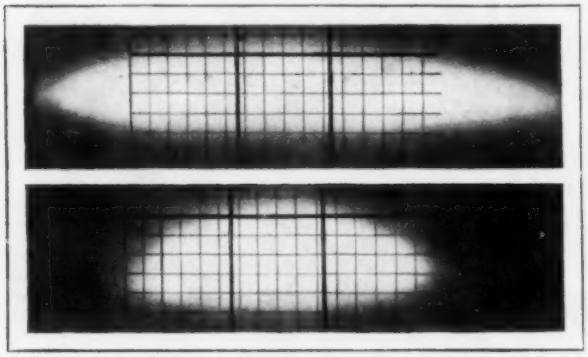
The simple steps may be summed up as follows: Clean the lamps; focus the bulbs; center the light spots on the marks; replace the lenses and tilt the lamps to allow for the loading of the car.

For the headlights, use only standard 21-cp. bulbs, since all approved headlighting devices are designed for use with bulbs of this candlepower. "Daylight" or blue bulbs of 21-cp. are available, but if these are used in the headlights, it may be found necessary to have the charging rate of the generator increased somewhat,

WHEELBASE	TOURING	SEDAN	COUPE	ROADSTER
100—110	8"	7"	6"	5"
110—120	7"	6"	5"	4"
120—130	6"	5"	4"	4"
130—140	5"	4"	3"	3"

since these bulbs consume about 50 per cent more current than the clear ones. Incidentally, many drivers have the impression that the blue bulbs give a better

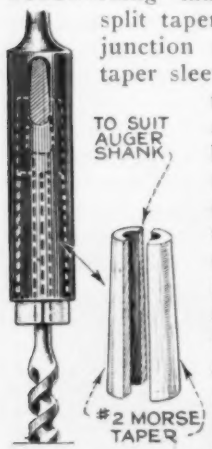
and more natural light than the clear ones, but tests have shown that, under ordinary conditions, there is no advantage in vision, while, where the illumination requirements are most severe, as on wet roads or in haze or fog, the light from the standard clear bulb is much better than that from the blue one. Incorrect voltage at the lamps, sometimes the cause of poor headlighting, may be due to an over or undercharged battery or to poor contacts.



Pattern from Lamps Properly Adjusted, but Employing Different Types of Lenses

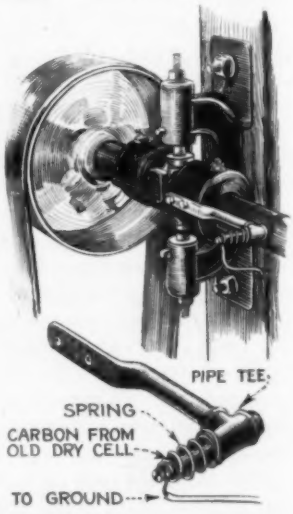
An Auger Chuck

The square, tapering end of the shank of carpenters' augers, which so nicely accommodates them to a bit stock, very effectually prevents their use in the chucks ordinarily found on machine tools and woodworking machinery. However, a split taper bushing used in conjunction with a No. 2 Morse-taper sleeve in the manner illustrated, holds the augers satisfactorily. It will be found that with this taper sleeve, the square end of the auger enters the recess into which the drill tang ordinarily fits, and is thus dogged against rotation, while the bushing holds the auger in correct alinement. The writer makes these bushings out of close-grained wood, preferably apple, hornbeam or beech. The shanks of augers are forged and are not quite uniform in diameter, hence, if the hole in the bushing is a few thousandths of an inch smaller than the largest diameter of the auger shank, the natural resiliency of the wood will hold the auger tight and true, taking up the variations of the shank.—Herbert A. Freeman, Willimantic, Connecticut.



Eliminating Static on Line Shafts

A static eliminator for line shafts in mills and factories will keep the employes from being shocked and from the serious consequences which might result. To make it, get an iron tee, ¾ in. in diameter, and a piece of ¾-in. threaded pipe. Flatten one end of the latter and drill holes in it, as shown. Fasten this unit onto some convenient bearing on the line shaft with two machine screws. Take a round carbon rod out of an old dry cell, scrape the surface smooth so that it will fit into the round hole in the tee; then connect a light coil spring to the carbon rod and to the tee. This exerts a pressure and keeps the rod against the shaft. The end of the carbon rod is connected to the ground, which results in the complete elimination of static.—Develle Thatcher, Kansas City, Mo.



Attachment for Milling Hexagon on a Shaft

Most small shops have only inexpensive attachments to take the place of a well-equipped milling machine and therefore every idea that facilitates the work helps. One job, which is not uncommonly called

for, is the milling of six splines or a hexagon on the end of a shaft. I have found that very good division of the shaft for milling can be done with the use of a hexagon nut. Fasten the nut on the shaft some distance from where the milling is to be done. Sometimes the end of the shaft is threaded so that a nut can be screwed up snugly against a shoulder. If not, a larger nut may be slid over the shaft and wedged securely. Before taking the first cut, level one side of the nut by rotating the shaft and clamp it in this position. After the cut is made, all that is to be done for each new cut is to level succeeding sides of the nut as before by rotating the shaft.—S. J. Gee, Salt Lake City, Utah.

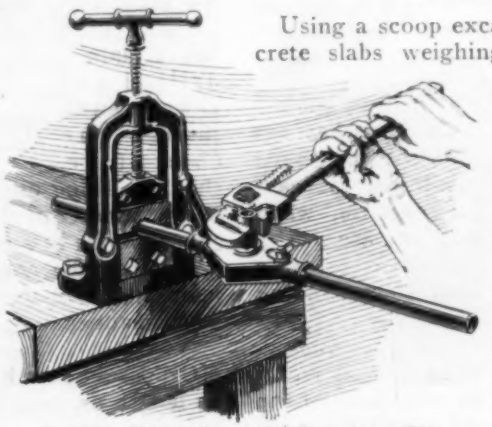
Sandbag Pulls Hay Fork Back

Dairy barns are usually longer than they are high, and when hay is unloaded through an end door into the loft, it is difficult to pull the fork back. A sandbag is sometimes used to pull the fork out but in long lofts the sandbag reaches the ground long before the car has been brought back. The drawing shows how one farmer overcame this difficulty. He stretched a length of No. 9 wire from the gable of the barn to a stake some distance from it, fastened the sandbag to an ordinary hay-fork pulley and attached this pulley to the draw rope on the fork. The sandbag is pulled up the wire when the bundle of hay moves into the barn and, when the fork is dumped, it slips back down the wire with the car and fork.

Sandbag Fastened to a Pulley on Wire, Which Is Run from the Barn Gable to a Stake in the Yard, Pulls the Hay Fork Back the Entire Distance in a Long Dairy Barn

Threading Short Lengths of Pipe

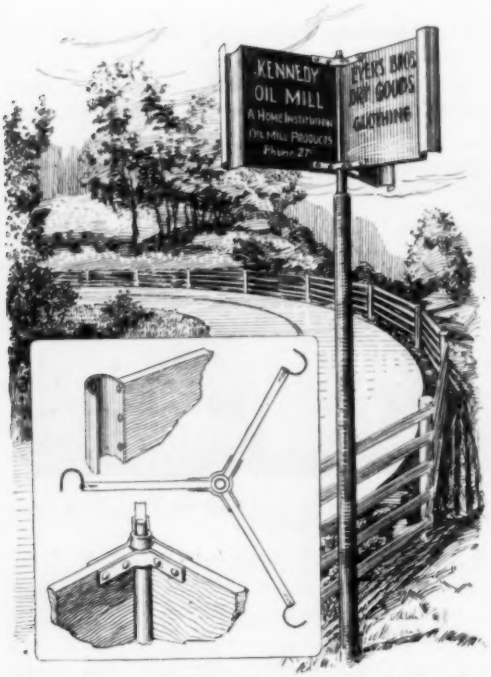
It is usually almost impossible to thread the ends of short pieces of pipe with an ordinary stock and die. Having to thread a number of such lengths, and also some ells, which I could not hold securely in the pipe vise, I used the method illustrated. The handle of the die stock was put into a vise and the pipe was threaded by screwing it into the die with a wrench. Pipes up to 1½ in. are easily threaded in this way.—Thos. J. Johnson, Cuero, Tex.



Method of Threading Short Lengths of Pipe

Scoop Excavator Is Used to Smash Concrete Slabs

Using a scoop excavator to tilt up concrete slabs weighing several tons each and shattering them by letting them fall, was the novel plan hit upon by a road-building contractor to get rid of about a mile of old pavement. After the slabs were smashed, the pieces were picked up by the machine and loaded into trucks for disposal.—Geo. F. Paul, Chicago.

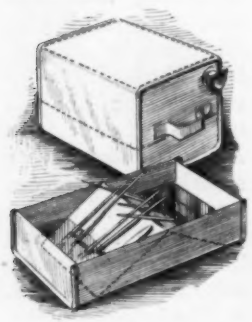


Novel Rotating Signboard Keeps Moving Almost Continuously in a Slight Breeze

Novel Revolving Sign

As it is always in motion, the sign shown in the drawing will attract considerable attention. It consists of three signs, each about 2 ft. square and made of 1-in. wood. They are fastened to a piece of 1½-in. pipe, 2½ ft. long, with small strap-iron brackets, and on the outside end of each board a vane is fastened. The vanes are made of tin, each being 2 ft. long and 8 in. wide, and bent to a semicircular shape. The sign is pivoted on a rod, so that a slight breeze will keep it in motion. —Thos. F. Johnson, Cuero, Tex.

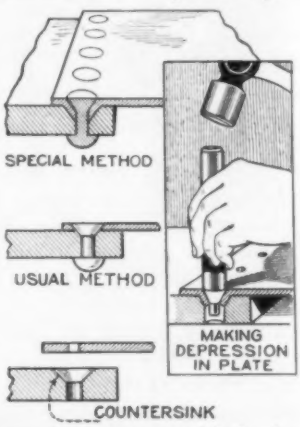
Brushes Placed in Oil Keep in Condition



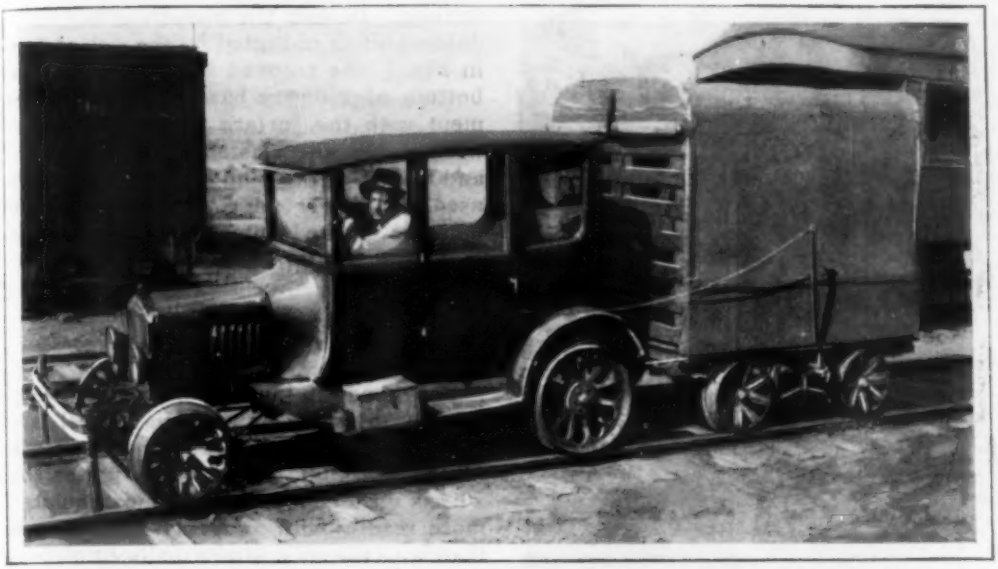
Paintbrushes can be kept in good condition by leaving them, when not in use, in a container of the kind shown in the illustration. It is made from a 5-gal. oilcan. This is cut in two. One of the sides is also cut off and bent to form a suitable angle, then set in the container as shown. The container is filled with lard oil to a height of about 1 in., or so that the bristles will be covered when the brushes are laid in the oil. As the weight of the brushes is supported mainly by the center piece, the hairs will not turn up and spread.—Jos. E. McLaughlin, Chicago, Ill.

Strengthening Riveted Plates by Special Countersinking

Sheet metal or thin plate can generally be joined to heavier plate by means of round-head rivets, and the strength of the plate increased. In pressure members, such as tanks, boilers and various other constructions, strength is essential, and a weak joint may break open if strained. But, in many instances, tubular pieces and other members, where an inner piston moves on the surface of the work, or where some part bears, round-head rivets cannot be used. Under such conditions, where countersunk rivets must be used, it will be found that the method shown in the illustration is far superior to the usual riveting, which is shown below. The recessed rivet, which draws the plate adjacent to it into the countersunk area, develops the full strength and more than normal bearing strength of the plate. To make this joint, the heavy plate is drilled and countersunk through the thin plate, this hole being one-half to two-thirds the body diameter of the rivet. A tool of the shape shown is used to set the thin plate down into the countersink in the heavy plate and then the rivet is driven in the usual manner.



¶Caliper a bored hole at several points in its length as the size at the opening may be misleading.



Handcar Wheels Attached to Automobile Enables It to Run over Railroad Tracks with Considerable Speed; Lengths of Hose Hanging from Bumper Brush Away Small Obstructions from Rails

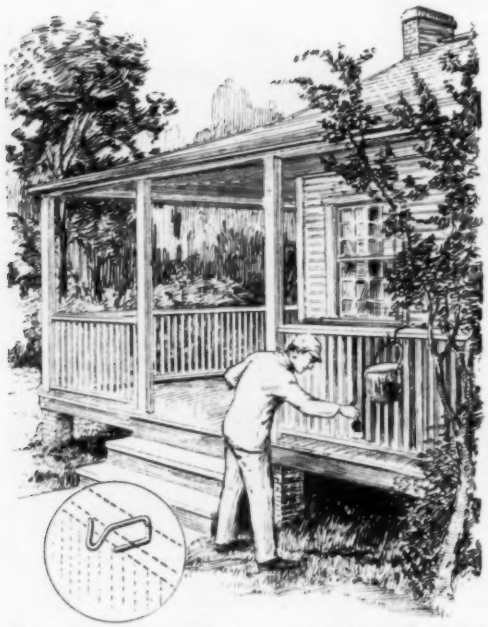
Auto Used for Train Service

Since automobile busses are hauling so many passengers and much express, the railroads have found it unprofitable to run passenger trains over some of their branch lines the year around. One western railroad simply put handcar wheels on a Ford sedan and a top on an ordinary pushcar, making a passenger and express train out of the two. The pushcar carries the express and mail for small towns along the line and the trip is made in one hour as the line is only 30 miles long. This speed is better than that of regular trains. The steering gear is disconnected and the front spindle bolt is clamped so that it cannot turn. Two short lengths of hose, running down to the rail from the bumper, serve to brush off small stones and weeds that might cause derailment if they were not removed.—Carlton Groat, The Dalles, Oreg.

Air Compressor Made from Old Motor

By transforming the two center cylinders of a four-cylinder gasoline engine into pumps and using the outer ones to furnish power, a garage owner of St. Paul, Minn., has constructed an efficient, compact air compressor at little cost. An old discarded motor was purchased for a few dollars and put in running order with odds and ends around the shop. The valves of the two center cylinders were bolted down to their seats and the push rods operating them were removed. Pipe connections were made with the spark-plug holes of the center cylinders and joined with a tee. A Y-coupling was joined to the tee, one side of the former being fitted with an intake check valve and the other with an outlet check valve. An old water-heater tank served as a radiator. The compressor runs at approximately 500 r.p.m. and easily supplies an air pressure of 125 pounds.—Jesse A. Leason, St. Paul, Minn.

Efficient Motor-Driven Air Compressor Made from Old Automobile Engine



Small Wire Hook, Slipped over Railing, Holds Paint Pot in Handy Position

Paint-Pot Hanger

Two painters had the job of painting the railing of a very long porch. They decided that it would be a hard and tiresome task to carry the pail as they proceeded. A stiff piece of large wire, which would not bend easily, was obtained and shaped as shown. This held the pail securely to the railing as they went along. —Charles Latour, Plattsburg, N. Y.

Improved Baseboard and Shoe

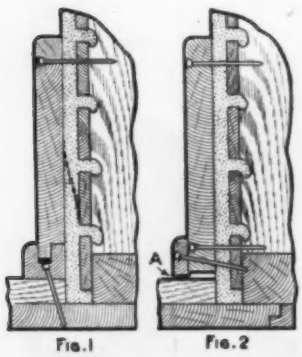
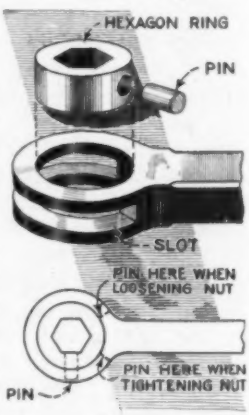


Fig. 1 Fig. 2

The accompanying drawing shows an improved baseboard and shoe. The advantages of this over the old form are quite obvious. The groove, into which the tongue of the baseboard fits tightly, prevents cracks of the kind indicated by the letter A in Fig. 2, caused by the baseboard shrinking or the floor settling. In case the plastering has been dubbed off as indicated by the dotted line in Fig. 1, the grooved shoe will keep the bottom edge of the base in proper alinement with the surface of the plastering, while, when the plastering is dubbed off and a shoe of the kind shown in Fig. 2 is used, the lower edge of the baseboard must be blocked out, in order to keep it in a true position.—H. H. Siegele, Emporia, Kans.

Shock Wrench for Grinder

The handiest kind of wrench to keep around an emery or polishing wheel is a shock wrench like the one shown in the illustration. The nuts used to tighten the wheels on the spindle can be manipulated more readily with a wrench of this type than with the solid kind usually employed. The principle is the shock, or knocking action, which tightens or loosens the nuts as the belt on the machine is pulled around. The wrench consists of a body cut to form a handle, which is drilled out at the end to take the hexagon ring and slotted to clear the pin that is driven into the ring. To loosen a nut the pin is at the top and the far side of the belt is pulled. To tighten the nut the opposite procedure is followed.—Harry Moore, Montreal, Canada.



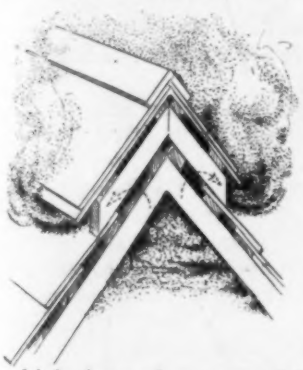
Analysis of Pump Troubles

If the pump handle rises slowly when released, it is an indication that the water is leaking through the valve to the pipe below. The check valve may be worn or some obstruction may have lodged between the valve and its seat. The remedy is to draw out the cylinder, remove the valve and clean the seat. If the leather is found worn, it should be replaced. If the handle jerks back, as if a spring were attached to it, the cylinder is too far from

the water supply or the water supply is shut off by some obstruction. Perhaps the screen has become filled with clay or gravel, or it may be that the suction pipe is too small for the size of cylinder used, but if the pump worked satisfactorily previously, this is not likely to be the case. The remedy generally consists in drawing out the suction pipe and cleaning the pipe and point screen. If the handle works up and down without apparent resistance and without delivering water, or a very small quantity, the leathers are worn out and must be replaced. However, this trouble may also be due to something being lodged under the valve. Air bubbles discharged with the water are caused by a leaky joint or a cracked pipe in the suction line, and can only be remedied by drawing out the pipe and repairing it. —C. C. Hermann, Moline, Ill.

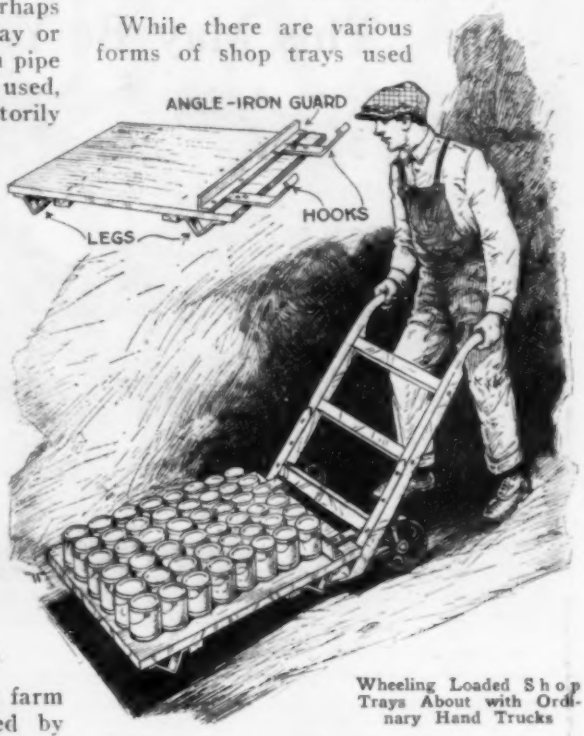
Smoke Escape for Workshop

Having an open tuyere in a small farm workshop, the owner was troubled by smoke which did not escape readily and filled the whole interior in a short time, making the air unfit for inhalation. The farmer eliminated this trouble by constructing the simple smoke escape illustrated in the drawing. He removed some roof boards at the ridge and nailed a few lengths of 2 by 4-in. wood lengthwise on the rafters as shown. The roofboards were nailed over these, which formed a sort of inverted trough over the ridge to prevent rain and snow from entering.



Truck for Moving Shop Trays

While there are various forms of shop trays used for the removal of parts from the machines where work on them has been done, the tray shown in the drawing will be found unusually handy because it can be moved with a hand truck. It has four legs, about 4 in. high. On one end two small hooks are fastened and these engage with a crossbar on the truck, while the lift heel of the truck bears against the bottom of the tray. As a means of handling material rapidly, this method has been found to be a decided improvement. Of course, the load has to be within the capacity of the hand truck.—G. A. Luers, Washington, D. C.



Wheeling Loaded Shop Trays About with Ordinary Hand Trucks

¶Chamois skin, moistened in water to which a few drops of kerosene have been added, can be used to clean the windows of the automobile as perfectly as desired; it is only necessary to go over them afterward with a clean dry cloth.

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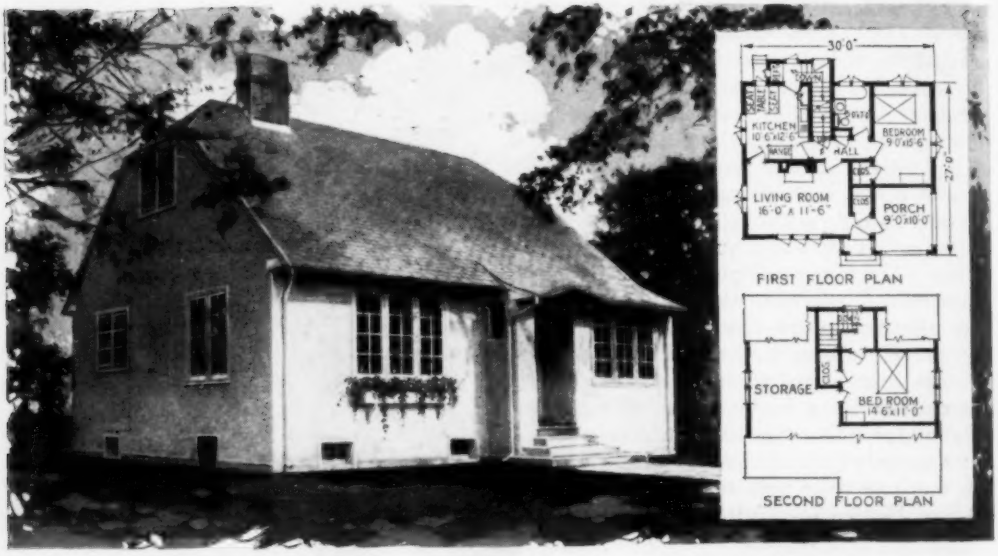
This May Be Your Home



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Plan No. 3A2

QUESTIONS regarding home building addressed to this magazine will be answered by The Architects' Small House Service Bureau of the United States, Inc., controlled by the American Institute of Architects and endorsed by the United States department of commerce. Inclose 10c and self-addressed envelope. Blueprints, specifications and material list for the house shown here may be obtained at nominal cost. Inclose self-addressed stamped envelope for reply. If further information is desired, send 5c and stamped envelope for a 24-page booklet explaining how the Small House Service Bureau functions and showing 12 sample plans. A new booklet, entitled "Fifty Ways to Lower Home Building Costs," illustrated by ten bureau houses actually lived in, and showing how as much as $1,000 can be saved on a home, may be obtained for 20 cents.

THE average three or four-room bungalow can be convenient and comfortable to live in, but is seldom distinguished for its architectural beauty.

This design provides three principal rooms on the first floor and a fourth room under the roof, combining usability, economy of building and fine appearance in an unusually successful manner. The plan is practically rectangular. This is a form that produces lower costs, but, on account of the clipped gable ends and the eyebrow treatment of the roof over the entrance, the design does not tend toward a box-like appearance such as many square houses have. The porch can be inclosed or left open as may be desired.

On the first floor there are three principal rooms with bath and three large closets. The kitchen is equipped with dining alcove, with built-in seats and table. The refrigerator stands in the rear entry and is equipped for outside icing.

The living room is made inviting by a fireplace opposite which there is a group of three windows.

The second story may be left incompleted for the time being or fitted with an additional room. If the fireplace is placed on the end wall of the living room, two rooms may be obtained in the attic.

Construction is wood frame on continuous masonry foundations. The exterior finish is stucco, but siding may be used. A 40-foot lot would be required. This house should face north or west but may be reversed.

Home Builders' Questions

Q. The foundation of my home is concrete and the inside is rough. I would like to fix this up in better shape and also make it lighter. Will you please advise the proper way to do this? A. Plaster the walls with white Portland cement.

Q. How do you thin varnish when it becomes thick? A. Do not add oil or other varnishes or liquid driers. Add only pure turpentine. Warm both the turpentine and thick varnish before mixing and let the mixture stand over night before using.